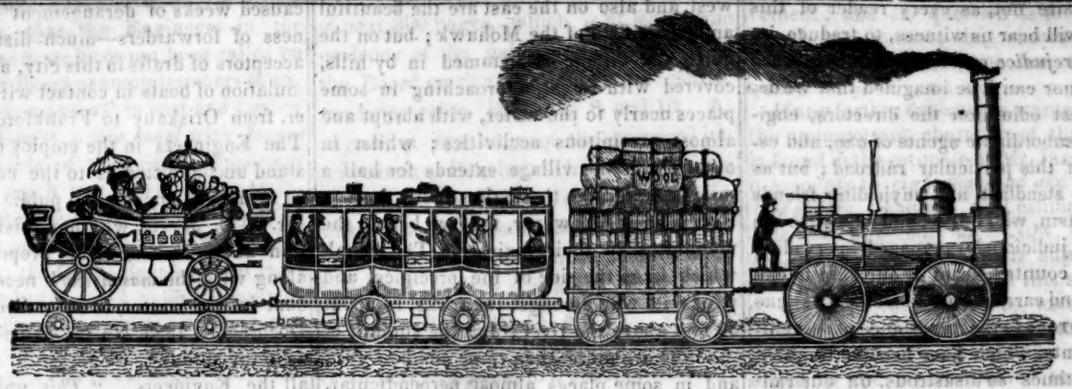


# AMERICAN RAILROAD JOURNAL,
## AND ADVOCATE OF INTERNAL IMPROVEMENTS.

PUBLISHED WEEKLY, AT NO. 122 NASSAU STREET, NEW-YORK, AT FIVE DOLLARS PER ANNUM, PAYABLE IN ADVANCE.

D. K MINOR, EDITOR.] SATURDAY, JULY 2, 1836. [VOLUME V.—No. 26.


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## AMERICAN RAILROAD JOURNAL.

NEW-YORK, JULY 2, 1836.

### TO CONTRACTORS.

ENGINEER DEPARTMENT, Lawrenceburgh and Indianapolis Railroad Company, June 20, 1836.

PROPOSALS will be received at this office until the 8th of August for the graduation and masonry on the first division of the Road.

This division commences near the Ohio River at Lawrenceburgh, Indiana, and follows the Valley of Tanners Creek a distance of ten miles.

Plans and Profiles of the Route and proposed works can be examined at the Engineers Office, Lawrenceburgh, Dearborn County, Indiana.

25—tau15 JULIUS W. ADAMS, Engineer.

### SYRACUSE AND UTICA RAILROAD.

BOOKS of Subscription to the above Stock will be opened on the 19th, 20th, and 21st days of July next, as follows, to wit: at the

"Syracuse House," in Syracuse.
Joseph C. Spencers's "Coffee House," Canastota.
J. H. Pratt's "Canal Coffee House," Utica.
"Mansion House," Albany.
Office of the "Farmers' Loan and Trust Company," New-York.

In Syracuse, Canastota and Utica the Books will be kept open from 9 to 12, and from 2 till 5, P. M., on the two first days, and on the last day till sunset.

In Albany and New-York from 10 till 3, P. M.

Capital Stock $500,000. Shares $50. $5 to be paid on each share on subscription. Payments to be made in specie or Bank bills of this State. Dated 10th June, 1836. I. S. SPENCEE, Secretary.

25—2t*

FOR SALE—At this office, a good LEVEL, made by Pike. It has a 20 inch telescope a sensitive bubble with a scale, stout level plates with clamp and tangent screws complete. It is a new instrument, has only had two weeks use; the owner having no further use for it, offers it for $118.

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NEW ARRANGEMENT.—I take pleasure in announcing to the readers of my periodicals that I have taken as a partner, in the business pertaining to them, Mr. GEORGE C. SCHAEFFER, a gentleman of education and a practical engineer.

Mr. Schaeffer will hereafter have the principal charge of the editorial department of the Journal and Mechanics' Magazine—in the discharge of which duties he has for several months past taken an active part—and, as we have reason to believe, much to the satisfaction of our readers and patrons.

With our united efforts we hope to render the periodicals worthy of a more extensive circulation.

This number it will be observed completes part *one* of Volume *five*.

D. K. MINOR.

New-York, July 2nd, 1836.

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### SERIOUS ACCIDENT ON THE RAILROAD.

We learn from the papers that a very serious accident occurred on Wednesday last, on the Boston and Providence Railroad. It is *said* to have occurred through the *carelessness* of the conductor of the Boston train, whose duty it was to wait until the Dedham train had passed. Whether it be so or not, there can be no doubt but that a fearful responsibility rests *somewhere*. It is the duty of the directors of every railroad company to employ sober, careful and prudent men. This however is not *all* they are bound to provide. They are also under the strongest obligations to establish *proper* regulations, and when they are established, to see that they are observed. The conductor of a locomotive engine who neglects to attend to his instructions, is equally culpable, if injury occur to any one, with the omnibus driver who disregards our city regulations, and drives furiously round a corner, to the destruction of life or limb; or with the engineer of a steamboat, who through strife or carelessness, destroys or injures the passengers; and we deem it a proper subject for investigation by the Grand Jury, who should inquire into the cause of not only the present, but also of previous accidents on Railroads; and in every case where injury has resulted to individuals through the carelessness of the managers, or conductors, they should be subjected to such penalties and punishments as will at least cause others to be more careful.

It is the duty of the directors to discharge, and publish the name of, every individual who shall, through *carelessness, negligence* or *intemperance*, cause injury to individuals or property. Nothing short of the most rigid scrutiny on the part of stockholders, directors, or engineers, will produce that confidence in the public mind towards railroads to which they are entitled: and it is the duty of every friend of the system to unite their efforts to prevent unavoidable accidents, and to punish the inividuals who cause those resulting from carelessness.

We desire not, as every reader of this Journal will bear us witness, to traduce, injure, or *prejudice* railroads, or the railroad system—nor can it be imagined that we desire to cast odium on the directors, engineers, or subordinate agents of *any*, and especially of this particular railroad; but as the early, steadfast, and unyielding friends of the system, who desire, and expect, to see them—if judiciously managed—pervading the whole country, deem it our duty to call the early and earnest attention of ENGINEERS and DIRECTORS to the importance of preventing accidents, which have been so frequent and oftentimes so disastrous, on our railroads. Let every accident be properly looked to, the circumstances published, and then let a just and merited censure fall upon those who trifle with the safety and lives of passengers.

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LITTLE FALLS.—This picturesque and thriving little village is situated on both sides of the Mohawk river, 72 miles west of Albany, and 22 miles east of Utica. The great western canal passes through it, on the south side of the river, and is connected with the main part of the village by a beautiful stone aqueduct over the river, which serves as a feeder, receiving the water from the old canal on the north side, and affording to the village every convenience desired for business.

This beautiful village was, until within a few years, owned by an English gentleman,) MR. Ellis, we believe,) and its *immense* water power was for many years, indeed almost since the revolutionary war, nearly useless, as the proprietor declined to sell, or even to give permanent leases, and the village of course made but slow progress in the march of improvement which has marked the course of many less favored places farther west.

Fortunately, however, here, as in many other places, a change has come over the aspect of things—a forign proprietorship give way to one of true American spirit. The title was about two years since transferred to a gentleman of this city, who viewed things as an AMERICAN. He caused the property to be surveyed, streets and public squares to be laid out, and has contributed largely to the erection of churches, and has sold freely and at fair prices to those who desired to improve its advantages. Those who, like ourselves, recollect its appearance *twenty* years ago, and have witnessed its progress under the fostering care of its present proprietor, need no description of its present condition, or its delightful surrounding scenery—but to those who have not witnessed its beauties, a brief description may not be uninteresting.

The village of Little Falls is situated in a narrow defile, which appears to have been formed by the waters of the river in its passage from the lakes to the Hudson, on the west, and also on the east are the beautiful and fertile flats of the Mohawk; but on the north the village is hemmed in by hills, covered with forest, approaching in some places nearly to the water, with abrupt and almost precipitous acclivities; whilst in other places the village extends for half a mile or more from the main street. It is on the south side, however, that we behold the mountains in their majesty. The canal, which hugs the side of the precipice, and winds its way amongst the rocks, is about 30 feet above the river; and the summit of the hills are more than *three hundred feet*, and in some places almost perpendicular, above the canal. This was indeed a herculean task; and to others than Americans, an attempt to construct such a work would have been deemed almost chimerical. It was however, accomplished, and is now the admiration of the hundreds of thousands who annually pass on its waters.

The improvements of the place are progressing with spirit—its water power is estimated equal to 750,000 spindles and several sites with power have recently been sold.—There are now in operation three furnaces, one turning shop, three paper mills, one machine shop, two saw mills, one flouring mill, one grist mill, one plaster mill, three tanneries, one distillery, two malting houses, three blacksmith shops, one axe and scyth factory and one carriage manufactory. A woollen factory, and two flouring mills with four runs of stones are to be erected the present season. This place being the centre of a rich agricultural country carries on a considerable trade with Albany and New-York. The item of cheese alone produced in Herkimer county, and shipped by its merchants, on the canal during the last season amounted to upwards of $350,000.

It is surprising to us who know and appreciate its advantrges, that a situation so eligible, so healthly and with such immense water power should have been until this period overlooked by this shrewd money making and speculating community. They will not longer be disregarded as proper attention is now directed to it; and the period is not distant when LITTE FALLS will boast of its numerous manufactories its rapidly increasing, intelligent, and wealthy population and its flourisng hischools. May it long continue to flourish, and its worthy proprietors, as well as its enterprizing population, reap rich reward for their labor.

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### ERIE CANAL ENLARGEMENT.

We notice the Canal Board are to meet Tuesday the 21st, and trust it is further to consider their resolutions to enlarge the Erie Canal, and that at all events they will place before the public the *modus operandi* of executing this important work, without *interrupting the trade upon*, which even for a day, or a week, cannot be permitted. The breach at Utica, of 3 or 4 days this spring, caused weeks of derangement to the business of forwarders—much distress to the acceptors of drafts in this city, and an accumulation of boats in contact with each other, from Oriskany to Frankford, 16 miles. The Engineers in the employ of the State stand uncommitted as to the enlargement, as far as has come to the public eye, except Mr. J. B. Jervis, who has raised the curtain as to the mode he proposes to get along with the *mason work* necessary to be done in the winter, to wit: See Assembly Documents, 1836, No. 99, pages 8 and 10; as to the summer, we are left in the dark by all the Engineers. "*This work must be done in the winter; and to protect the cement from frost, a house must be erected over the site, and a proper temperature maintained by stoves.*"

Before this work is further progressed in, the pnblic require that there shall be a responsibility rest somewhere, in the event of failure; and that we have a right to expect one, is evident, or there is a gross neglect of duty on the part of the superintendents, which we do not charge them with, when the fact is stated, and notorious to all forwarders, *that the Erie Canal has been gradually filling up by deposits, since its construction*, and so little time has there been to clear it out, during the time of suspended navigation, (let alone enlarging it,) that boats drawing over 2½ feet of water cannot now navigate our *nominal* 4 feet canal, *without touching the bottom!!* and such is its present state, and the constant *contact of boats*, from its narrowness and their increasing numbers, that boats last only 4 years, upon an average, instead of 6 years, as was the case after the first construction of the Erie Canal. Boats, with even 35 to 38 tons, rubbing on the bottom to their serious injury, even with the water in many parts being raised 12 to 18 inches above the 4 foot line as first constructed, and this too, from the necessity of the case on the part of the superintendents, to keep up and open early our trade, at the risk of constant breaches, in the canal, and to its great and constant injury.

That the Canal Board wish to meet the public expectation, in opening the Erie Canal as early as possible, there can be no doubt,—nor do they desire to run the risk of interrupting the trade upon it; but when it is gravely stated, by one of their engineers, [who has not, so far, risked his reputation, by presenting his plan in his report that this work—*more difficult and expensive than building an entire new canal, 8 feet by 80 or 90 feet wide,*] that the enlargement can be accomplished, *by excavating on the basin or heel-path bank, in the summer, "leaving a cone or cove in the middle, to be removed during the time of suspended navigation,"* when a large part of the mason work, locks, culverts, aqueducts, &c., is to be executed, "under the cover of houses, kept to the proper temperature by stoves!!!" It may

be the case, that the Engineers in the employ of the State have not been called on by the Canal Board or commissioners to express their opinions as to cost and facility of construction of a *new canal* with *larger locks*, along side of the present important work, at a much less expense than to attempt to patch on to an old and *imperfect work*. The public call for opinions on this subject from the Canal Board. As it is to be an expenditure of 12 to 20 millions of dollars, the best engineering talents in and and out of the State, should be *personally* examined before the Canal Board, at the expense of the State, instead of getting delphic and *gratuitous* replies from Engineers to written queries on the subject of the enlargement, as we understand was the course adopted prior to proposing the plan to the Legislature. Even these queries and replies are in none of the State documents, and a fearful responsibility rests somewhere, in the anticipated event of the enlargement plan being a failure. OSWEGO.

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From the N. Y. Times.

ERIE CANAL ENLAEGEMENT.

In the Times of the 21st inst. (June) an article appeared under the above head, over the signature of Oswego. After alluding to the meeting of the Canal Board, and calling for information in relation to the manner they intended to proceed with the proposed work, the writer observes—"Up to this time, the Engineers in the employ of the state, stand uncommitted, except so far as Mr. J. B. Jervis has raised the curtain, as to the manner he proposes to execute the necessary mason work to be done in the winter, to locks, culverts, aqueducts, &c, in speaking of it. See Assembly Doc. No. 99 of 1836, pages 8 and 10.—This work must be done in the winter, and houses built over the same, with stoves to keep up a proper temperature."

The idea that would be taken by most readers, would no doubt be, that Mr. Jervis had recommended that all the mason work for "locks, culverts, aqueducts, &c." should be done in the winter and protected from frost as above stated. This construction, however, is more favorable than some we have seen, for we recollect seeing an article in some newspaper a few months since, in which he is made to recommend that not only masoury, but the *entire* canal should be covered to protect the work of enlargement from frost. To guard the public from an entire misapprehension of the doings of the Canal Board and their Engineers, we have thought it worth while to examine the report alluded to. The document is reports of engineers accompanying the report of the Canal Board, presented to the legislature 26th January, 1836, of near 300 pages, which is at least some evidence of the *publicity of the doings* of the Board on this subject. Your correspondence refers to pages 8 and 10. At page 8, in speaking of the propased improvement at Schoharie Creek, in reference to the *Guard* lock, Mr. Jervis says "This work must be done in the winter, and, to protect the cement from frost, a house must be erected over the site, and a proper temperature maintained by stoves." Here, it will be observed, the proposition is expressly for a *Guard Lock*, in a peculiar situation which is explained in the report referred to, and no intimation is given that this method is proposed for every ordinary or *lift* lock; and even in the case of this particular *Guard* lock, Mr. Jervis goes into a course of reasoning to show that the old line at this place should be abandoned, and the Creek crossed by an aqueduct, instead of the present mode, by a dam and *Guard* lock.

In this general estimate he leaves the present line at this place, and gives the estimate on the new line which he recommends. It therefore appears he does not recommend the plan of erecting a house over any lock whatever.

In relation to aqueducts, page 10 of said document Mr. Jarvis observes, "When the abutments are sound, they may be extended in the summer season, and the trunks put on during the suspension of navigation. But in cases where it is necessary to *rebuild the old part of the abutment*, it is proposed (*unless the line can be changed*) to do the work in the winter; and to guard against the influence of frost, &c." It is not then for the purpose of enlarging the canal, but to *renew* the work *indispensable* to the maintenance of the *present* navigation that this plan is proposed; and even this, ouly in cases where a change of line is not practicable.

In relation to culverts on the page above quoted, Mr. J. observes, "The culvers that are sound will only require to be lengthened, and new wings and parapets put on one end which *may be done during the ssason of navigation*. Some new culverts will be required, and when the levels are lowered, they will generally require to be rebuilt This work can only be done in the season of suspended navigation. and when it is necessary to make them of *stone and cement*, a house must be erected," &c.

The cases, it appears, in which culverts will require to be built in the winter, will mainly depend on the imperfection of those now in operation; and whether they will require protection from frost, will depend on the necessity of using *cement*. The part under bottom of canal in some cases may be made of *timber*, or of *cast iron*, or of stone so well cut and secured as not to require cement; and the question is presented by Mr. J. in a manner that shows that very little of this kind of protection will be required.

If any further evidence is wanted to show the unimportant character of this item, it is found in the estimate of Mr. Jarvis, where it amounts to *eight thousand and four hundred dollars*. But the *total* estimate of Mr. J. is near *three millions*. Now, we would ask, can any candid man suppose that your correspondent viewed this small item of so much importance as to call public attention to it? If so, then he was in honor bound to have given it only the importance it had in the report referred to. But as before quoted, it will be perceived that "locks, culverts, aqueducts, &c." are to be built in the winter and protected from frost, &c. We have seen that there is *no* proposition to build the locks in this way; and that your correspondent had no occasion to be alarmed for the culverts and aqueducts. But where are his et cetera? They imply that there is something else—but nothing of the kind is found in the report of Mr. J. except what we have quoted.

From the examination we have given to this subject we are brought to the conclusion that your correspondent was disposed to find fault, and considering the proposition alluded to as novel, and probably to him incomprehensible, he has thought it worthy of presentation to the notice of your readers. In regard to the novelty, however, he is mistaken. It has been adopted to build locks on even American canals; and where circumstances require it, it is no very fearful undertaking.

The doings of the Canal Board are charged by your correspondent as hidden from public view. Now as we are not at liberty to say who your correspondent is, we will put on the broad mantle of charity, and presume he has but partially read the public documents that contain the proceedings of this board, and which are easily found on the printed journrls of the several Legislatures to whom they have been presented.

We are led to the further conclusion, that if in a document of near three hundred pages, this is the only item on which "the curtain has been raised," there must have been extraordinary stupidity, or wonderful ingenuity. The document is before the public, and any one may examine it, and we believe any candid man will find on examination, that it proposes to enlarge the Erie Canal from Albany to Buffalo, and gives, in as much detail as is usual, an estimate of the expense; and much remark in relation to the matter of doing the work, communicated in a candid and unreserved manner.

It would be drawing out this communication to too great a length to go into an exposition of their doings. But as several communications have been made besides that of your correspondent, tending to give the impression, that the Canal Board contemplated stopping, or interrupting the navigation of the Erie Canal, and that the work of enlargement could only be done in the winter, we will merely mention, that their official reports, and those of the Canal

Commissioners, with accompanying documents, unequivocally take the ground, that the *suspension* or *interruption* of the *navigation* is admissible, and that the great majority of the work, is to be done in the usual season of performing such work; and even the manner of doing work in the season of navigation in several cases, supposed to be attended with most difficulty, have been referred to or pointed out. There is nothing that can be considered proof against misrepresentation, but we are confident that any candid man will be satisfied on reading the printed proceeding of the Canal officers, that there has been a plain practical and uneqvivocal mode of proceeding, not only in relation to the enlargement of the Erie Canal, but of all their duties as public officers in a most important branch of the affairs of the State Government.

We hope, therefore, that your correspondent, before he presents any further account of their doings, will examine their published proceedings, and give the public a correct account. Such a course will do the Canal Roard no harm, be honorble to your correspondent, and promote TRUTH.

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We are gratified to be able to publish the following correspondence between a committee of the Common Council of New Brunswick and a committee of the Railroad Company. We trust the day will be as fair and pleasant for the celebration, as the advantages of the work will surely be great to New Jersey.

From the Newark Daily Advertiser, June 29.

NEW JERSEY RAILROAD OPENED TO NEW BRUNSWICK.

The following invitation of the Common Council of New Brunswick, to the President and Directors of the New Jersey Railroad and Transportation Company, and the correspondence on the subject we insert with plasure, as an annunciation to the public that their Railrord will be complete to New Brunswick by the 1st of July, and also as an evidence of the friendly feelings and deep interests manifested by our sister city towards this important enterprise.

*New Brunswick, June* 6, 1836.

At a meeting of the Board of Common Council, held this evening, the following preamble and resolution were adopted; viz:

"Whereas it is understood that the New Jersey Railroad will be completed in a short time—and whereas the citizens of New Brunswick feel a deep interest in the completion of said work, Therefore,

Resolved, That a Committee be appointed to make arrangements for the proper reception of the President and Directors of the New Jersey Railroad Company upon their arrival in this city, when said road is first opened."

PETER CONOVER, Clerk.

(A true copy.)

The Committee appointed consists of—the Recorder, Alderman Zabriskie, and Mr. Vail.

NEW BRUNSWICK, June 11th, 1836.

*To the President and Directors of the New Jersey Railroad and Transportation Company—*

GENTLEMEN:—The undersigned having been appointed a Committee by the Common Council of this city, "to make arrangements for the proper reception of the President and Directors of the New Jersey Railroad and Transportation Company, upon their arrival in this city when said road is first opened," will proceed with alacrity in the performance of that duty, actuated by emotions of no ordinary character, believing as the Committee do, that the work, about being completed, is emphatically a *New Jersey improvement*, and that it will eventually tend more to the developement of the resources of our State, and add more to the convenience of our citizens, than any other work that can be constructed within its limits.

The Committee would respectfully suggest whether if the road be completed by that time, it would not be proper to connect that event, (so important to the interests of our State,) with the anniversary of our National Independence.

The Committee would be pleased to learn the day that may be selected for the celebration of the event above referred to at your earliest convenience.

Respectfully, your obedient servants,

JAMES C. ZABRISKIE,
STAATS VAN DUERSON,
D. W. VAIL.

*Committee &c.*

—

NEWARK, June 25th, 1836.

*To J. C. Zabriskie, S. Van Duerson, and D. W. Vail, Esquires, Committee of the Common Council of New Brunswick:*

GENTLEMEN: The New Jersey Railroad and Transportation Company have assigned to us the agreeable duty of accepting the polite invitation of the Common Council of New Brunswick, and of making the arrangements appropriate to the occasion. In behalf of those we represent, we tender you our acknowledgments for the very kind terms with which you have been pleased to characterize our work, and we fondly trust that time will confirm all your favorable anticipations. Its progress has not been unattended with the difficulties and toil incident to undertaking of this character and magnitude; but the unwavering confidence and steady perseverance of the capitalists* with whom we are assaciated, have enabled us to prosecute thns far with gratifying success, this "*New Jersey improvement*," and we feel entirely assured from the fidelity and devotion already manifested, that the same spirit will coutinue to its final consummation.

We deem that tribute justly due to those to whom this state is chiefly indebted, for the construction of a work which it is the highest aim and desire of its projectors should prove a powerful means of "*developing the resources of New Jersey, and of promoting the convenience of its citizens,*" and we rejoice that we have been the humble instruments of awakening an enlarged spirit of enterprise in a section of the State, which, though rich in resources, had long been neglected, and in furnishing facilities of communication, which cannot fail greatly to advance its wealth and prosperity. It is to us a source of sincere gratulation, that whatever may be the prospects of revenue to our work, its beneficial influence to others in promoting the value of property, in facilitating and fostering social intercourse, and in advancing the business operations of the community at large will be immeasurably greater.

Our road will be completed to your city by the first of July, and it is highly complimentary to our company, that you should propose to connect the celebration of its opening with the anniversary of our National Independence; but as this day is consecrated to commemmorate by general jubilee the most important event in our country's history, we hope you will permit us to postpone our excursion, until after that period; we accordingly have designatnd Thursday, the 7th of July, as the day on which our company will be happy to receive the hospitable civilities of your city.

We have the honor, Gentlemen to be, very respectfully, your obedient servants,

GEORGE L. SCHUYLER,
JOHN P. JACKSON,

*Committee, &c.*

[*We presume the allusion is to the enterprising house of Nevins, Townsend & Company, of New York City, whose names are honorably connected with a number of the most important public works in this country.—Ed.]

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From the Cortland Advocate.

☞ The Syracuse, Cortland, and Binghampton Railroad Central Committee, it will be seen by the following notice, have called a meeting of the Commissioners named in the bill incorporating the above named work, and although the proceeding may not be strictly regular, it will be excused, as it cannot result prejudicially to any one, and as it secures great despatch, and is more convenient than any other method. The step was taken by the Central Committee, at the request of the resident Commissioners.

The Commissioners to open the books, etc. of the "Syracuse, Cortland and Binghamton Railroad," are requested to meet at the Eagle Tavern, in Cortland Village, on Tuesday the 12th day of July next, at 12 o'clock M:—

The Commissioners are as follows:—Henry Stephens, Eleazer W. Edgcomb, Augustus Donnelly, Samuel G. Hathaway, Edward C. Reed, Roswell Randall, William Randall, Samuel S. Foreman, Elam Lynds, Myrom S Mills, Henry F. King, Duniel Dickinson, Joseph S. Bosworth, and Thomas G. Waterman.

WILLIAM RARLITT,
ADIN WEBB,
HENRY S. RANDALL,
*Central Committee.*

June 23, 1836.

# APPENDIX

TO

## PAMBOUR ON LOCOMOTION.

Continued from page 394.

The *data* laid down above must therefore be taken each in their speciality, that is to say, the one as suitable to a slow motion, with engines of a certain construction and intended for the draft of goods, and the other to a rapid motion with engines of a different construction, and intended for the draft of passengers.

Before we close this article, we must remark that the repairs of the railway consist principally in replacing the blocks, chairs, keys, and pins. The rails themselves, being in malleable iron, seldom break. As for their gradual decrease of weight, by wear, this is a very inconsiderable effect.

On May 10th, 1831, on the Liverpool line, a malleable iron rail, 15 feet long, carefully cleaned, weighed 177 lbs. 10½ oz. On February 10th, 1833, the same rail, taken up by Mr. J. Locke, then resident engineer on the line, and well cleaned as before, weighed 176 lbs. 8 oz. It had consequently lost in 21 months a weight of 18½ oz. The number of gross tons that had passed on the rail during that time was estimated at 600,000. Thus we see that with so considerable a tonnage, and with the velocity of the motion on that railway, the annual loss of the rail was only $\frac{1}{268}$ of its primitive weight. So that it would require more than a hundred years to reduce it to the half of its present strength.

### § 3. *Expense of Fuel.*

In regard to fuel, we have already, in Chapter IX. of this work, related experiments from which may be deduced the consumption of fuel according to the load the engines have to draw.

However, as in the intervals of the trips the fire must be kept up, and as, besides, there are always unavoidable losses during working, an increase of expense in that respect must naturally be expected in practice. This we also learn in a positive manner by the examination of facts.

According to the half-yearly reports of the Liverpool Railway Company, for the year ending June 30, 1834, the expense for fuel for the locomotive engines was

£6,079 15*s.* 8*d.*

The number of trips performed was 11,656; consequently the expense for fuel for each journey amounted to 10.432*s.*, and as the average price of coke employed during that year on the railway was 23.5*s.*, the consumption of fuel, measured in weight, amounted to 994.37 lbs. per trip.

We have seen (Appendix, § 1.) that the total number of gross tons conveyed by the locomotive engines of the company from one end of the railway to the other, in the same number of journeys was

373,776 t.

The average load of the engines was consequently about 32 tons.

A load of 32 tons, not including the tender, has consequently required, by the fact, a consumption of coke of 994 lbs. So, considering that the load has been really carried to a distance of 34½ miles, this makes 0.90 lbs. per gross ton drawn to a distance of one mile on a level. Our special Experiments (Chap. IX. § 2.) only give an average consumption of 784 lbs. of coke for a load of 32 t. By this it will be seen that, in practice, and with the nature of the business on that line, the different losses amount to one-fourth of the expense of the active work.

This increase is owing not only to the necessary expense for lighting the fire every morning, but also to the necessity, on that line, of keeping, for the passage of the inclined planes, helping engines, the fire of which must remain lit the whole day, although they only serve at distant intervals, and to the long delays between one journey and another. These circumstances, that of the helping engines alone excepted, are inevitable in a business of the nature of that of Liverpool.

On the Darlington Railway the same causes of loss do not exist, at least not to the same degree.

According to the notes, carefully kept by the directors of that company to serve as a foundation to the contracts they sign, the quantity of coals consumed on an average, during one journey of an engine, that is to say, to convey 24 wagons to a distance of 30 miles down hill, and bring them back again empty to the same distance up hill, costs the engine men 4*s.* 9¾*d.*, when the coals are at 5*s.* per ton. So the weight of coals consumed is 2157 lbs.

The *useful* load drawn by the engine is composed of 63.60 t. of coals in going down, and there is no *useful* load at all in going up; making an average of 31.80 tons of goods drawn to a distance of 40 miles in all.

This weight, from what we have seen (Appendix, § 1.) corresponds with a *gross* weight, drawn on a level to the same distance, of

$$31.80 \text{ t.} \times 1.9717 = 62.70 \text{ t.};$$

the consumption of coals per gross ton carried to a distance of one mile on a level is, consequently, 0.86 lb.

This is nearly the same consumption as on the Liverpool Railway, especially if we consider that a ton of coals, of a good quality, produces a little more evaporation than the same weight of good coke.*

This result may appear surprising, the boilers of the Darlington engines being generally constructed on a less economical principle, as to the application of heat, than the Liverpool ones; but considering the way of working on each line, this circumstance will easily be accounted for. On the Darlington Railway the engines never go off but with a full load; that is to say, that they draw, as we have mentioned, an average weight of 62.7 t. per trip, and we know that this circumstance is favorable to the consumption of fuel. If these engines were to draw only an aveage load of 32 t., like the Liverpool ones, their comparative consumption would certainly be greater. To this must also be added that, on the Darlington Railway, the engines undergo no delay between their journeys, and that the invariability in the load and in the speed makes it unnecessary to give them more evaporating power than is strictly wanted for their motion. The consequence is that one never sees at the valve that enormous blowing which takes away from the Liverpool locomotive engines a fourth part of their produce.

It is to these combined circumstances that the practical result appearing in this case, must be attributed.

* The proportion of the quantity of coke prepared in a closed vessel, and of Newcastle coals, necessary to transform the same quantity of water into steam at the same pressure, is nearly as 14 to 13.

### § 4. *Total Expense of Haulage.*

The remaining expenses of the haulage require, on our part, no separate discussion. The particulars will be found in the following statements relating to the Liverpool Company. But their aggregate amount acquaints us with the total expense of haulage by means of locomotive engines, and this is a point which requires some consideration as well as the former ones.

According to the statements concerning the year in question, we see that the total expenses of the Liverpool Company amounted to the following sums:

| | £ | s. | d. |
|---|---|---|---|
| 1st half-year . . . | 56,350 | 1 | 9 |
| 2nd half-year . . . | 60,092 | 15 | 11 |
| | £116,442 | 17 | 8 |

But our purpose being to know the expenses relating to the use of the locomotive engines taken separately, in order to compare the amount with the total haulage they executed, we must deduct from that sum the following articles:

| | £ | s. | d. |
|---|---|---|---|
| 1st. Interest on loans | | | |
| 1st half-year | 5,140 | 6 | 4 |
| 2nd half-year | 5,546 | 4 | 0 |
| 2nd. Stationary engine and tunnel disbursements | | | |
| 1st half-year | 1,307 | 16 | 5 |
| 2nd half-year | 986 | 10 | 3 |
| 3rd. New rails, this being an extraordinary expense | | | |
| 1st half-year | 150 | 16 | 0 |
| 2nd half-year | 3,153 | 14 | 0 |
| 4th. From the amount for maintenance of way, new rails not included, must be deducted $\frac{1}{10}$ for expenses concerning the tunnels, that are not worked by the locomotive engines and the length of which is 1½ mile on the 31 miles of the whole line 1st half-year | 627 | 10 | 0 |
| 2nd half-year | 619 | 14 | 0 |
| 5th. On the rest of the expense for maintenance of way must also be deducted $\frac{2}{3}$, being expenses occasioned by the passage, with their trains, of locomotive engines not belonging to the company. The haulage effected by the engines of the company being 373,776 tons, carried on the whole line. We have seen (Appendix, § 2) that the work of the engines not belonging to the company, raises the tonnage to 515,252 tons; consequently the work of the latter engines is 141,476 tons, or $\frac{2}{3}$ of the haulage of the company's engines. This article makes | | | |
| 1st half-year | 2,258 | 18 | 0 |
| 2nd half-year | 2,231 | 0 | 0 |
| Total sum to be deducted | £22,022 | 9 | |
| Remains for expenses concerning the work of the company's locomotive engines | 94,420 | 8 | 0 |

The haulage executed by the same engines being
12,895,272 gross tons carried to a distance of one mile,
the consequence is that, on the Liverpool Railway, at an average velocity of 16.73 miles per hour, the total expense of haul-

age by locomotive engines amounts to 1.75 d. *per gross ton carried to a distance of one mile on a level.*

This includes all sorts of expenses, carriages, rent, offices, &c.

On the Darlington Railway the expenses of haulage are much lower. The company estimates them at 1.00 d. *per ton of coals* carried to one mile *in going down* the line; which, after our calculation (Appendix, § 1.,) would make 0.51 d. per *gross* ton carried to one mile *on a level.*

The cause of that difference between the two railways has already been mentioned, being the velocity of the motion and the nature of the goods conveyed. To this must also be added the considerable difference in the price of fuel, the Darlington Company employing coals which cost only 5s. per ton, instead of 28s. 6d., the price of the coke used by the Liverpool Company. But the use on that line of several ways of working either by locomotive or stationary engines, or by horses, does not permit us to class and verify the expenses with the same precision as in the case of Liverpool. This is the reason why we shall not enter into any particulars in that respect.

### § 5. *Profits.*

After having examined the expenses, it is also necessary to cast a look on the receipts. Before we go over to the specified statements of the expenses of all sorts of the Liverpool Company, we shall therefore take down here, from those same statements the amount of the profits made by the company from the opening of the railway. This sketch will show that, if the mode of haulage in question necessitates considerable expenses for its establishment, the profits it produces are fully adequate to indemnify speedily the shareholders.

The road was opened to trade on September 16th, 1830, and from that period the dividends per share of £100 sterling amounted to the following sums:

| | | | |
|---|---|---|---|
| December 31, 1830 | £2 | 0 | 0 |
| June 30, 1831 | 4 | 10 | 0 |
| December 31, 1831 | 4 | 17 | 8 |
| June 30, 1832 | 4 | 4 | 8 |
| December 31, 1832 | 4 | 8 | 0 |
| June 30, 1833 | 4 | 7 | 6 |
| December, 31, 1833 (besides a reserved fund of 4,088 8s. 10d.) | 4 | 15 | 3 |
| June 30, 1834 | 4 | 15 | 2 |
| Total Sum from Sep. 16, 1830, to June 30, 1834, that is to say, in three years, nine months and a-half | £33 | 18 | 3 |

This sum makes 9 per cent. a-year, besides the reserved fund laid aside by the company, and notwithstanding the extraordinary expenses inevitable at the beginning of an undertaking, which being the first of its kind, was necessarily obliged to pay dearly for its own experience, whilst future railways will profit by that acquired by their predecessors.

Besides this high interest for the capital invested, we repeat that the shares of this railway, from the original price of £100 sterling, have risen, and sell at present, after four years establishment only, at £210; and that those of the Darlington Railroad, which boasts only nine years' existence, give 8 per cent. interest, and have risen in that short interval from £100 to £300, which is their present price.

This plain recital of facts speaks volumes. It is, therefore, unnecessary for us to add any reflection.

We shall be happy if the elucidations we have already given and those we intend to subjoin be of use to persons who may feel inclined to engage in these speculations, which, in regard to expenses, cannot fail to be as advantageous to their private fortune as to the prosperity of the country at large.

We shall conclude this Appendix by giving the specified statements of the receipts and expenditure of the Liverpool Company, from its origin to the present moment.

## EXTRACTS

FROM THE REPORTS OF THE DIRECTORS OF THE LIVERPOOL AND MANCHESTER RAILWAY, FROM THE OPENING OF THE RAILWAY, ON THE 16TH SEPTEMBER, TO THE 30TH JUNE, 1834.

### STATEMENT OF EXPENDITURE ON CAPITAL ACCOUNT.

| | |
|---|---|
| Amount of expenditure on the construction of the way and the works, from the commencement of the undertaking to 31st December, 1833 | £1,089,818 17 7 |

### ANNUAL OR WORKING ACCOUNT.

FROM 16TH SEPTEMBER TO 31ST DECEMBER, 1830.

| | |
|---|---|
| Nett profits of the Company | £14,432 19 5 |
| Dividend per share of £100 | 2 0 0 |

HALF-YEAR ENDING 30TH JUNE, 1831.

| | |
|---|---|
| Nett profits of the Company | £30,314 9 10 |
| Dividend per share of £100 | 4 10 0 |

HALF-YEAR ENDING 31ST DECEMBER, 1831.

| | Tons. |
|---|---|
| Merchandise between Liverpool and Manchester | 52,224 |
| Road traffic | 2,347 |
| Between Liverpool and the Bolton junction | 10,917 |
| Coal from Huyton, Eltonhead, and Haydock collieries brought by the Company's engines | 7,198 |
| Coal from Hulton brought by the Bolton engines | 1,198 |
| Number of passengers booked at the Company's offices | 256,321 |
| Number of trips of 30 miles performed by the locomotive engines with passengers | 2,944 |
| Do. with goods | 2,298 |
| Do. with coal | 150 |

*Receipts.*

| | | | |
|---|---|---|---|
| Coach department | £58,348 | 10 | 0 |
| General merchandise | 30,764 | 17 | 8 |
| Coal department | 605 | 14 | 5 |
| | £89,809 | 2 | 0 |

*Expenses.*

| | | | |
|---|---|---|---|
| Office establishment | £902 | 3 | 10 |
| Coal disbursements | 60 | 15 | 5 |
| Petty ditto | 110 | 0 | 5 |
| Cart ditto | 60 | 17 | 8 |
| Maintenance of way | 6,599 | 12 | 6 |
| Charge for direction | 297 | 19 | 0 |
| Coach office establishment | 589 | 5 | 9 |
| Locomotive power | 12,203 | 5 | 6 |
| Advertising | 59 | 3 | 4 |
| Interest | 2,737 | 7 | 3 |
| Rent | 900 | 5 | 3 |
| Compensation (coaching department) | 156 | 7 | 5 |
| Engineering department | 625 | 0 | 0 |
| Carrying disbursements | 10,450 | 12 | 3 |
| Taxes and rates | 2,763 | 5 | 1 |
| Stationary engine disbursements | 269 | 4 | 7 |
| Coach disbursements | 6,709 | 7 | 1 |
| Wagon ditto | 979 | 19 | 8 |
| Compensation (carrying department) | 786 | 8 | 2 |
| Police establishment | 1,490 | 14 | 1 |
| Law disbursements | 98 | 9 | 10 |
| Bad debts | 175 | 13 | 6 |
| | £49,025 | 18 | 5 |
| Nett profit from 1st July to 31st Dec. 1831 | £40.783 | 3 | 7 |
| Dividend per share of £100 | 4 | 10 | 0 |
| Nett profit on Sunday travelling per share of £100 | 0 | 7 | 8 |

HALF-YEAR ENDING 30TH JUNE, 1832.

| | Tons. |
|---|---|
| Merchandise between Liverpool and Manchester | 54,174 |
| Traffic to and from different parts of the road | 3,707 |
| Between Liverpool and the Bolton junction | 14,720 |
| Coals from different parts of the road brought by the Company's engines | 22,045 |
| Coals brought by the Bolton engines | 7,411 |
| Number of passengers booked at the Company's offices | 174,122 |
| Number of trips of 30 miles performed by locomotive engines with passengers | 2,636 |
| Ditto with merchandise | 2,248 |
| Ditto with coals | 234 |

*Receipts.*

| | | | |
|---|---|---|---|
| Coaching department | £40,044 | 14 | 7 |
| General merchandise department | 32,477 | 14 | 0 |
| Coal do | 2,184 | 7 | 6 |
| | £74,706 | 16 | 1 |

*Expenses.*

| | | | |
|---|---|---|---|
| Bad debt account | 394 | 5 | 7 |
| Carrying disbursem'ts. Coach disbursements. Guards' and porters wages, £1104 4 6—Parcel carts and drivers' wages, £254 10 5—Omnibuses and duty, £1082 0 7—Repairs and materials, £1777 9 4—Gas, oil, tallow, &c. £228 14 6—Stationery and sundry disbursements, £441 1 7 | 4888 | 0 | 11 |
| Salaries £1749 5 10—Porters' wages £3562 0 8—Brakesmen's wages £461 5 9—Oil, tallow, cordage &c. £561 12 6—Carting £808 16 5—Repairs to jiggers, trucks, &c. £163 14 11—Stationery and sundry expenses, £563 10 8 | 8010 | 6 | 9 |
| Coal ditto | 26 | 8 | 10 |
| Cartage (Manchester) | 1420 | 4 | 9 |
| Charge for direction | 308 | 14 | 0 |
| Compensation (coaching) | 101 | 10 | 9 |
| Compensation (carrying) | 288 | 10 | 3 |
| Coach office establishment (salaries, £573 13 1—Rent and taxes, £106 10 0.) | 680 | 3 | 1 |
| Engineering department | 520 | 9 | 0 |
| Interest | 5966 | 14 | 11 |
| Locomotive Power. Fuel and watering £2907 8 0—Oil, tallow, hemp, &c. £507 3 1—Repairs and materials £5947 6 5—Enginemen's wages £1170 18 8 | 10,582 | 16 | 2 |
| Maintenance of way (wages, £3929 8 0—Blocks, sleepers, chairs, &c. £2668 12 3—Ballast, £733 0 3) | 7,3331 | 0 | 6 |

| | | |
|---|---|---|
| Office establishment (salaries, £662 8 6—Rent and taxes, £77 9 2—Stationery, &c. £81 10 5) | 811 8 1 | |
| Police and gatekeepers | 1356 9 11 | |
| Petty disbursements | 75 1 0 | |
| Rent | 1840 1 10 | |
| Stationary engine and tunnel disbursement, new tunnel rope, £330 10 8—Coal £265 7 0—Wages £290 9 9—Repairs, oil, tallow, hemp, &c. £165 8 9 | 1051 16 2 | |
| Taxes and rates | 1109 14 9 | |
| Wagon disbursements. Smiths' and joiners' wages, £586 6 7—Iron, timber, &c. £265 0 9—Canvass, paint, &c. for sheets, £155 10 10 | 1006 18 2 | |
| | £47,770 15 5 | |
| Deduct credits | 1,112 4 1 | |
| | £46,658 11 4 | |
| Nett profits for six months | £28,048 4 9 | |
| Dividend per share of £100 | 4 0 0 | |
| Nett profit on Sunday travelling per share of £100 | 0 4 8 | |

HALF-YEAR ENDING 31ST DECEMBER, 1832.

| | Tons. |
|---|---|
| Merchandise between Liverpool and Manchester | 61,995 |
| Ditto, to different parts of the road, including the Warrington and Wigan trade | 6,011 |
| Ditto, between Liverpool and Bolton | 18,836 |
| Coals from various parts of the road to Liverpool or Manchester | 39,940 |
| Number of passengers booked in the Company's offices | 182,823 |
| Number of trips of 30 miles performed by the locomotive engines with passengers | 3,363 |
| Do. with goods | 1,679 |
| Do. with coals | 211 |

*Receipts.*

| | |
|---|---|
| Coaching department | £43,120 6 11 |
| General merchandise | 34,977 12 7 |
| Coal department | 2,804 3 4 |
| | £80,902 2 10 |

*Expenses.*

| | |
|---|---|
| Bad debt account | £81 6 0 |
| Coach disbursements. Guards' and porters' wages £1173 19 6—Parcel carts and drivers' wages, £375 14 4—Materials for repairs, £464 1 9—Mens' wages, repairing £613 18 1—Gas, oil, tallow, &c. £232 11 7—Duty on passengers £985 19 1—Stationery and petty expenses £414 19 7 | 4261 3 11 |
| Carrying disbursements. Salaries £1822 18 2.—Porters', &c. wages, £3925 7 4.—Gas, oil, tallow, cordage, &c. £296 11 7.—Repairs to jiggers, trucks, stations, &c. £398 3 11.—Stationery and petty expenses £540 13 5. | 6983 9 5 |
| Coal ditto | 27 2 10 |
| Cartage (Manchester) | 2744 18 7 |
| Charge for direction | 295 1 0 |
| Compensation (coaching) | 209 15 11 |
| Ditto (carrying) | 150 19 11 |
| Coach office establishment (Salaries £556 3 10—Rent and taxes, £75 16 2) | 631 19 0 |
| Engineering department | 450 0 0 |
| Interest | 4555 15 7 |
| Locomotive power. Fuel and watering, £3848 10 8.—Oil, tallow, hemp, &c. £661 1 9.—Materials for repairs, £3723 9 7.—Men's wages, repairing, £3352 16 2.—Engine and firemen's wages, £1060 11 6. | 12,646 9 8 |
| Law disbursements | 118 3 8 |
| Maintenance of way (wages £3675 16 5—Block, sleepers, chairs, &c. £2355 17 1—Ballast, &c. £846 10 9) | 6878 4 3 |
| Petty disbursements | 66 2 0 |
| Rent | 1246 5 0 |
| Stationary, engine and tunnel disbursements (Coal, £209 15 3—Engine and brakemen's wages, £316 7 5—Repairs, gas, oil, tallow, &c. £326 14 7) | 852 17 3 |
| Taxes and rates | 3483 18 2 |
| Wagon disbursements. Smiths' and joiners' wages, £583 0 5—Iron, timber, &c. £350 12 10.—Canvass, paint, &c. for sheets, £31 0 0. | 946 13 1 |
| Office establishment (Salaries, £623 18 0—Rent £85 0 0—Stationery £18 9 0) | 727 7 0 |
| Police ditto | 902 16 5 |
| | £48,278 8 10 |
| Nett profit for six months | £32,623 14 0 |
| Dividend per share of £100 | 4 4 0 |
| Nett profit on Sunday travelling per share of £100 | 0 4 0 |

HALF-YEAR ENDING 30TH JUNE, 1833.

| | Tons. |
|---|---|
| Merchandise between Liverpool and Manchester | 68,284 |
| Ditto, to different parts of the line, including Warrington and Wigan | 8,712 |
| Ditto, between Liverpool, Manchester and Bolton | 19,461 |
| Coals from various parts, to Liverpool and Manchester | 41,375 |
| Total number of passengers booked in the company's offices | 171,421 |
| Number of trips of 30 miles performed by the locomotive engines, with passengers | 3,262 |
| Ditto with merchandise | 2,244 |

*Receipts.*

| | |
|---|---|
| Coaching department | £44,130 17 2 |
| Merchandize ditto | 39,301 17 3 |
| Coal ditto | 2,638 15 9 |
| | £86,071 10 2 |

*Expenses.*

| | |
|---|---|
| Advertising account | £50 8 7 |
| Bad debt account | 176 18 6 |
| Coach disbursements. Guards and porters' wages, £1150 4 0—Parcel carts, horse keep and drivers' wages, £401 18 6—Materials for repairs, £383 15 11—Men's wages, repairing, £758 10 6—Gas, oil, tallow, cordage, &c. £324 4 0—Duty on passengers, £2466 15 4—Stationery and petty expenses, £236 15 6—Taxes on offices, stations, &c. £112 18 4 | 5,835 2 1 |
| Carrying disbursements. Agents' and clerks' salaries, £1703 17 6—Porters' and brakesmen's wages, horse keep, &c. £4687 9 7—Gas, oil, tallow, cordage, &c. £648 4 11—Repairs to jiggers, trucks, stations, &c. £405 13 1—Stationery and petty expenses, £336 9 0—Taxes, insurance, &c. on offices and stations, £798 1 8. | 8,579 15 9 |
| Coal disbursements | 120 16 1 |
| Cartage (Manchester) | 2460 16 1 |
| Charge for direction | 252 0 0 |
| Compensation (coaching) | 38 1 2 |
| Compensation (carrying) | 1033 18 3 |
| Coach office establishment (Agents' and clerks' salaries, £577 19 6—Rent and taxes, £102 17 1) | 680 16 7 |
| Engineering department | 441 17 4 |
| Interest | 5,367 11 9 |
| Locomotive power. Coke and carting, £2795 4 5—Wages to coke fillers, and watering engines, £338 16 10—Gas, oil, tallow, hemp, &c. £760 15 2—Copper and brass tubes, iron, timber, &c. for repairs, £3290 8 8—Men's wages, repairing, £4115 0 8—Enginemen and firemen's wages, £892 4 4—Out-door repairs to engines, £943 6 8—Two new engines, "Leeds" and "Firefly," £1580 0 0 | 14,715 16 9 |
| Maintenance of way (wages, £3648 18 5—Blocks, sleepers, chairs, &c. £2052 5 11 Ballast and draining, £1013 5 11) | 6,714 9 9 |
| Office establishment (Salaries, £624 19 0—Rent and taxes, £62 18 6—Stationery, &c. £56 19 5) | 744 16 11 |
| Police | 950 4 7 |
| Petty disbursements | 70 0 0 |
| Rent | 601 15 8 |
| Repairs to walls and fences | 296 4 0 |
| Stationery engine and tunnel disbursements (Coal £155 8 1—Engine and brakemen's wages, £363 8 10—Repairs, gas, oil, tallow, &c. £340 15 11 | 859 12 10 |
| Tax and rate | 1,891 0 7 |

| | | |
|---|---|---|
| Waggon disbursements (Smiths' and joiners' wages, £598 3 1—Iron, timber, &c. £320 1 4—Cordage, paint, &c. for sheets £82 7 3) | 1,000 11 8 | |
| Cartage (Liverpool) | 18 4 6 | |
| | £52,900 9 1 | |
| Nett profit for six months | £33,171 1 1 | |
| Dividend per share of £100 | 4 4 0 | |
| Nett profit on Sunday travelling per share of £100 | 0 3 6 | |

HALF-YEAR ENDING 31ST DECEMBER, 1833.

| | Tons. |
|---|---|
| Merchandise between Liverpool and Manchester | 69,806 |
| Ditto, to and from different parts of the line, including Warrington and Wigan | 9,733 |
| Ditto, between Liverpool, Manchester, and Bolton | 18,708 |
| Coal from various parts to Liverpool and Manchester | 40,134 |
| Total number of passengers booked at the company's offices | 215,071 |
| Number of trips of 30 miles performed by the locomotive engines with passengers | 3,253 |
| Ditto, with merchandise | 2,587 |

*Receipts.*

| | |
|---|---|
| Coaching department | £54,685 6 11 |
| Merchandise ditto | 39,957 16 8 |
| Coal ditto | 2,591 6 6 |
| | £97,234 10 1 |

*Expenses.*

| | |
|---|---|
| Advertising account | 6 10 0 |
| Bad debt account | 374 10 1 |
| Coach disbursements. (Guards and porters' wages, £1168 4 6—Parcel carts, horse keep, and drivers' wages, £361 1 7—Materials for repairs, £689 12 6—Men's wages, repairing, £1041 1 3—Gas, oil, tallow, cordage, &c. £196 4 11—Duty on passengers, £3224 11 11—Stationery and petty expenses, £277 4 5—Taxes on offices, stations, &c. £116 0 8—Guards' clothes, £54 15 0.) | 7,138 16 9 |
| Carrying disbursements. (Agents' and clerks' salaries, £1728 16 9—Porters' and brakesmen's wages, horse keep, &c. £5006 6 10—Gas, oil, tallow, cordage, &c. £529 17 0—Repairs to jiggers, trucks, stations, &c. £366 9 11—Stationery and petty expenses, £429 5 1—Taxes and insurance on offices, &c. £456 17 7—Sacks for grain, £110 3 10.) | 8,627 17 0 |
| Coal disbursements | 82 0 9 |
| Cartage (Manchester) | 3,173 18 0 |
| Charge for direction | 812 18 0 |
| Compensation (coaching) | 142 4 8 |
| Compensation (carrying) | [223 10 11 |
| Coach office establishment (Agents' and clerks' salaries, £602 6 8—Rent, £30) | 632 6 8 |
| Engineering department | 319 3 4 |
| Interest | 5,140 6 4 |
| Locomotive power. (Coke and carting, £3197 4 4—Wages to coke fillers and waterers, £348 8 5—Gas, oil, tallow, hemp, cordage, &c. £865 14 9—Brass and copper, iron, timber, &c. for repairs, £3755 3 7—Men's wages, repairing, £4401 4 10—Engine and firemen's wages, £784 8 5—Out-door repairs to engines, £613 3 9.) | 13,965 8 1 |
| Maintenance of way. (Wages to plate layers, joiners, &c. £2937 19 2—Stone, blocks, sleepers, keys, chairs, &c. £2411 2 4—Ballasting and draining, £925 16 11—New rails, £150 16 3.) | 6,425 14 8 |
| Office establishment (Salaries, £607 2 0—Rent and taxes, £75 14 3—Stationery and printing, £22 7 8—Stamps, £17 2 3) | 722 6 2 |
| Police | 1,022 7 6 |
| Petty disbursements | 61 19 6 |
| Rent | 603 10 8 |
| Repairs to walls and fences | 665 3 4 |
| Stationary engine and tunnnel disbursements, (Coal, £302 6 5—Engine and brakesmen's wages, £319 11 2—Repairs, gas, oil, tallow, &c £419 15 5—New rope for tunnel, £266 3 6) | 1,307 16 6 |
| Tax and rate | 3,409 11 0 |
| Wagon disbursements. (Smiths' and joiners' wages, £718 19 7—Iron, timber, castings, &c. £700 7 1—Cordage, paint, &c. £28 5 2—Canvass for sheets £163 6 5) | 1,611 0 8 |
| Cartage (Liverpool) | 80 17 10 |
| Law disbursement | 300 3 9 |
| | £56,350 1 9 |
| Nett profit for six months | £40,884 8 4 |
| Dividend per share of £100 | 4 10 0 |
| Nett profit on Sunday travelling per share of £100 | 0 5 3 |
| Reserved fund formed in the six months | 4,088 8 10 |

HALF YEAR ENDING 30TH JUNE, 1834.

| | Tons. |
|---|---|
| Merchandise between Liverpool and Manchester | 69,522 |
| To and from different parts of the road, including Warrington and Wigan | 15,201 |
| Between Liverpool, Manchester and Bolton | 19,633 |
| Coal to Liverpool and Manchester | 46,069 |
| Number of passengers booked at the Company's offices | 200,676 |
| Number of trips of 30 miles performed by the locomotive engines with passengers | 3,317 |
| Ditto with merchandise | 2,499 |

*Receipts.*

| | |
|---|---|
| Coaching department | £50,770 16 11 |
| Merchandise ditto | 41,087 19 5 |
| Coal ditto | 2,925 15 11 |
| | £94,784 12 3 |

*Expenses.*

| | |
|---|---|
| Advertising account | £16 15 0 |
| Bad debt ditto | 75 12 3 |
| Coach disbursements. (Guards'and porters' wages, £1167 11 10—Parcel carts, horse keep and drivers' wages, £359 13 0—Materials for repairs, £1007 9 7—Mens' wages, repairing, £1221 15 5—Gas, oil, tallow, cordage, &c. £358 15 6—Duty on passengers, £3008 1 11—Stationery and petty expenses, £165 2 5—Taxes, insurance, &c. on offices and stations, £65 8 11) | 7,353 18 7 |
| Carrying disbursements. (Agents' and clerks' salaries, £1740 14 2—Porters' and brakesmen's wages, horse keep, &c. £5397 8 5—Gas, oil, tallow, cordage, &c. £708 17 4—Repairs to jiggers, trucks, stations, &c. £716 2 8—Stationery and petty expenses, £290 3 2—Taxes, insurance, &c. on offices and stations, £469 6 2) | 9,322 11 3 |
| Coal disbursements | 45 1 0 |
| Cartage (Manchester) | 2,988 6 2 |
| Charge for direction | 289 16 0 |
| Compensation (coaching) | 26 3 10 |
| Compensation (carrying) | 645 6 0 |
| Coach office establishment (Agents' and clerk's salaries, £615 1 11—Rent and taxes £63 1 1) | 678 3 0 |
| Engineering department | 352 10 0 |
| Interest | 5,546 4 0 |
| Locomotive power. (Coke and carting, £2882 11 4—Wages to coke fillers and watering engines, £386 19 5—Gas, oil, tallow, hemp, &c. 881 18 4—Copper and brass tubes, iron, timber, &c. for repairs, £4140 19 6—Men's wages for repairing, £5432 8 8—Enginemen and firemen's wages, £836 14 3—A new engine, £700—Lathe engine, boiler and fixing for repairing sheds and watering stations, £380 6 4.) | 15,641 17 10 |
| Law disbursements | 100 0 0 |
| Maintenance of way. (Wages and small materials, £4221 2 5—Stone, blocks, sleepers, &c. £1482 18 7—New rails and chairs, points, crossings, &c. £3153 14 5—Ballast and leading, £493 2 0) | 9,350 17 5 |
| Office establishment (salaries, £818 14 4—Rent and taxes, &58 8 0) | 877 2 4 |
| Police | 1,016 18 1 |
| Petty disbursements | 60 0 0 |
| Rent | 363 11 11 |
| Stationary engine and tunnel disbursements, (Coal, £327 | — |

| | | |
|---|---|---|
| 12 1—Engine and brakesmen's wages, £385 7 0—Repairs, gas, oil, tallow, &c. £273 11 1) . . | 986 10 | 2 |
| Tax and rate . . . | 1,778 16 | 10 |
| Wagon disbursements. Smiths' and joiners' wages, £773 3 8—Iron, timber, &c. £728 12 4—Cordage, paint, &c. £109 19 2—Canvass for sheets, £240 0 0 | 1,851 15 | 2 |
| Repairs to walls and fences . | 664 0 | 11 |
| Cartage (Liverpool) . . | 80 17 | 6 |
| | £60,092 15 | 11 |
| Net profit for six months | £34,691 16 | 4 |
| Dividend per share of £100 | 4 10 | 0 |
| Nett profit on Sunday travelling per share of £100 . | 0 5 | 2 |

From the immense mass of testimony, collected by the Select Committee of the House of Commons on Accidents in Mines, we have selected the following article in relation to a novel and ingenious method of lighting, not only mines, but all places where actual exposure of flame to the atmosphere, might be productive of dangerous explosions or conflagrations.

We recollect a domestic application of this method, that was ingenious enough in its operation.

A gentleman had lost a knife of some value, at the bottom of a very deep well. By means of a large mirror, he reflected the sun's rays to the bottom of the well, and immediately discovered the position of the knife. A magnet, attached to a line, was let down upon it, and brought up the knife with it. We have not unfrequently used this method of illumination, when in search of some small article in an obscure corner of a dark closet.

### MR. GOLDSWORTHY GURNEY'S SAFETY METHOD OF LIGHTING MINES.

(From the Minutes of Evidence taken before the Select Committee of the House of Commons on Accidents in Mines.)

Has it ever occurred to you to consider whether mines might be lit under such circumstances as to do away with the necessity of the moveable lamp?—The subject has been one which I have lately considered a good deal, in conseqence of being engaged again in experiments of a similar kind to those of 1822; I have recently made a series of experiments for the Trinity House on artificial light; and the resul.s of these experiments, and observations connected with them, induce me to believe it possible to light coal mines without taking flame at all into mines: In a few words, I will state, that I think it capable of being done by reflected light. In these experiments I found artificeal light may be produced, so intense that when placed in the focus of a parabolical reflector, it will throw a distinct shadow at the distance of eleven miles. Now, as light is capable of being concentrated, reflected, and refracted in any angles, or in any direction, or in any quantities, I think it possible that such light may be reflected into mines, subdiv ded, and passed through the galleries, in sufficient quantities and intensity as to enable miners to work far better than by lamps of any description. The light itself, and the combustion to produce it, could be placed above the shaft, in the open air. If, however, from mechanical difficulties, such as obstructing parts in the way of its passage down the shaft, it is possible that the light might be placed in some safe part of the mine itself, where fire-damp is never found, and from thence be reflected and refracted through the various parts of the mine. I have made experiments with this view, and have found light capable of being reflected, in various directions, with simple and inexpensive reflectors; the first reflection requires a true parabolic reflector, but afterwards plain and simple surfaces will do. Possibly, the whole mine and galleries may be all lit by a single light, if not very extensive; but if seven lights of the first order be placed in the focus of seven true 12 inch parabolas, and arranged within a circle of 3 feet diameter, which they may be, I firmly believe one of the longest mines might be most effectually lighted in every gallery. No one can judge of the power and management of this light who has not seen it, or possibly conceive its practicability to the subject before us. I need not go into explanation of the manner of doing it. The Committee will remember that, as the angle of reflection is always equal to the angle of incidence, we may throw the light in whatever direction we please; by this means we may turn it round a corner at right angles, or in any angles suited to the drifts the mine happens to be cut into. The practical difficulties connected with this plan chiefly, I conceive, are those arising from obstructions in the galleries: one, for instance, is the air-doors, which are necessarily used for ventilation; there is no difficulty, however, in such case in placing a piece of plate-glass in some particular part of the door, so as to admit the passage of the light through it, or a second light may be brought in an opposite direction; again, if the galleries are so low that there is not room for the light, coal wagons or miners, to pass together, it is possible so to widen them, or enlarge them, that there would be a sufficient space for a sufficient quantity of light to pass; it may be passed through very small openings by strong concentration, and afterwards diverged as may be necessary.

Would it not be attended with great expense?—No.

Less than the ordinary mode?—I am not prepared to say exactly, but I think it would not be more expensive than the present mode. In case the light is not required to be very great, I think a light of less intensity might be used, with advantage, that would be less expensive than the present oil-lamps. A very simple but powerful light, is about to be adopted by the Trinity Board for light-houses, which, by way of distinction, and in reference to the place where it was discovered, has been called the "Bude Light." This light produces an intensity 140 times that of the present Argand burner; this light, therefore, may be used where the ramifications of the mine, or greater extent, does not require the first order, namely, the lime light. In some cases, the light from the common Argand burner, placed in a parabolic reflector, may be sufficient, and in that case it certainly would be cheaper. I am of opinion, from the experiments and investigations made at the Trinity House, that the light from lime, and also the Bude Light, is less expensive than that of the ordinary light, taking quantity and intensity into account, which may be sub-divided to equal intensity with the first; the intensity of the one is 290 times greater than the other, and the intensity of the second 140; thus one is capable of giving the same quantity as 290 Argand burners, and the other as much as 140.

The term Bude Light has no application to the peculiar manner in which it is produced?—It is a term simply used to distinguish it.

From what is it derived?—It is produced by striking nacent carbon, evolved in the combustion of oil, resin, or similar bodies, with oxygen gas.

You have spoken of difficulties in the introduction of this new system of lighting in the mines of this country; apply your mind for a moment to the difficulties which might arise in the mines not having above two or three feet depth of seam?—I think such difficulties are to be overcome by inexpensive boring or widening to admit the light to pass; in such a drift a stream of light, highly concentrated, of six inches diameter, would be ample, and whether it passed by the side or the top of the gallery, it matters not. A large quantity of light, by simple means, might be concentrated in such case, and passed along such an opening, and afterwards diverged in larger galleries, if such was indispensable. These are points upon which I think the Committee will find other persons more capable of giving information on than myself.

Supposing a light is required to be in a straight line for a mile, there would be on difficulty in obtaining a sufficient light at the terminus?—The light at the distance of a mile would enable you to read the smallest print. If it is reflected two or three times in that distance through a circuitous passage, you would lose very little. if you use good reflectors made of speculam metal. The quantity of light lost by such reflection is very trifling.

The question related to the casting of light upon one object at the distance named?—So I have answered it; it is of little consequence whether it be straight a-head, or at the end of a curved or angular gallery.

In case that light is then to be divided into fifty different directions, so as to suit different galleries, what would be the consequence as regards the terminus?—The result would be, that the light would simply be reduced fifty times in quantity; it would be divided into fifty portions; it would then be still stronger than the strongest Argand burners; and I beg to be understood as meaning the Argand burner used on the tables of private families, not the little oil burner of the safety-lamp. I will make an observation here which may be important, namely, the stream of light may be sent through the various galleries, and when it arrives at the situation where the men are working, every man, with a little reflector or refractor. as may be determined on, may take that portion of light which may be intended for him, and no more, from the great stream, and thus limit him the quantity of light that he may abstract from the stream; which portion he may at pleasure direct wherever he pleases on the work before him; so that instead of a lamp, he would work with a little diverging reflector, or refractor, which he would carry in his pocket, perhaps of the size of half-a-crown.

Do you not think that the experiments of scientific men might be better made in the mines themselves, than they could be in their own laboratory?—Certainly; if a principle is established, it rests as a matter of mechanical detail, or of mechanical situation and position, to know whether it can or cannot be applied, practically, with advantage. Sir George Cayley informs me that he used the principle of reflection to throw daylight to some men who were

working a deep well. It had a beautiful effect, and answered the purpose perfectly. His reflector was nothing more than a piece of tin plate. The daylight is not sufficiently intense; we cannot focus it so as to be passed through the galleries of mines.

In your opinion, would the experiment be better conducted by placing the light above the shaft, or at the bottom of the shaft?—It would depend on the depth and size of the shaft.

Assume 200 yards in depth?—In such case above; you get at the materials and apparatus for forming the light better; the distance of 200 yards has very little effect in diminishing the light; reflected light does not obey the same laws as radiated light; radiated light diminishes as the squares of the distances, but reflected light does not; this is contrary to received opinions, but I am satisfied it is correct, from the observations I have lately made.

You have not supposed any difficulties in the application of this light, beyond those already stated, which the Committee understand to be the interruptions occasioned by stoppings or trap-doors in the mines, or the extreme sub-division of the reflected light?—I have: there are others, but I think of minor importance, which can only be justly apprec ated in practice.

The shafts of the mines are placed at right angles, that is, they are driven along, and they begin at the further end, and then work upwards; is there any difficulty in transmitting the light at right angles?—Not any difficulty whatever; you may transmit the light in any angle you please; it may first be thrown down a shaft, and then sent into any angle, upwards or downwards, or on one side or on another.

Suppose there be a space of two or three feet left on one side, or both sides, of the carriages conveying the minerals along the galleries, the light might be transmitted independently of the space occupied by the carriages?—Certainly.

Or through a similar space above the carriages?—Yes.

And you propose, to obviate the difficulty of passing through the trap-doors, that means in the mines, by the insertion of glass in those doors; what is the smallest size you would consider sufficient for that purpose?—It would depend upon the situation in which the door was placed in the mine; if in the first gallery, where you wanted the full stream or supply of light to pass, you would require twenty inches diameter; when doors occur further on, in the division of light, perhaps three or four inches in diameter would be sufficient.

Would that be sufficient to light a gallery at the distance beyond the door many hundred yards, if twelve feet wide?—Certainly. There is another valuable natural fact that I would mention here: the stream of light, as it passes through the air, is refracted by the atmosphere, and thrown in all directions several yards, with an intensity sufficient for practical purposes. My house at Bude has a long gallery in it; I passed a stream of reflected light through that gallery; every bed-room entering into the gallery was sufficiently illuminated in every part for a person to pick up a pin. The light in the bed-rooms was refracted light, from the reflected light passing through the gallery. I conceive that unless men are working at some distance from the stream of light through a gallery, a reflector would be scarcely necessary for them. Dust floating in the atmosphere, reflects a good deal of light sideways.

Would the accumulation of dust upon glass so inserted in one of the trap-doors, be a serious impediment to the light?—Not practically, because it could be easily wiped away.

Are you aware that a boy is generally stationed to take charge of those doors?—Yes.

And of course, he might have instructions to keep the glass perfectly clean?—Certainly.

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From the Baltimore Farmer and Gardener.

## VIRTUES OF LIME AS A MANURE.

We mentioned last week the republication of the excellent essay on this subject, by M. Puvis, in pamphlet form, and promised to give the very able *introduction*, with which the edition is prefaced,—from the pen of Professor Renwick, of Columbia College, New-York. It will be found below and will more than repay the reader for the time devoted to its perusal; for it is in truth a most luminious paper, replete with intelligence which every farmer should be in possession of. His explanations of the constituents of soils and the mode of action of lime, upon peculiar soils, are both so plain that none who wish to comprehend them can mistake their import. For ourself we are gratified to find gentlemen of Professor *Renwick's* distinction putting their shoulders to the wheel in support of the cause of agriculture, as, besides the brilliant lights which are thrown out by them, the influence of their names is of incalculable value. We should not omit mentioning that the public are indebted chiefly to *James Wadsworth*, Esq. of New-York for the edition of this excellent work.

"The chemical facts and principles which are applicable to agriculture, are neither numerous nor complete. They are, however, to be found only in works on general chemistry, in which they are intimately associated with laws and phenomena of a more abstruse description, and in connection with which they constitute a science of which the most learned are still students, and to attain which in its existing form may require years of close and attentive study. The language, too, of chemistry, which, to those who study it in a regular course, serves as an artificial memory. and single words of which call up long trains of thoughts and experiment, presents the uninitiated all the difficulties of a foreign tongue.

Yet it cannot be doubted, that the practical farmer may derive important benefit from acquiring so much of this language as will enable him to understand the chemical explanation of the numerous changes which are continually taking place in the natural actions which it is his high privilege to call into his service, to direct in part, and modify in degree. So also certain chemical elements and compounds, with the properties of which he ought to be acquainted if he wish to be able to direct his practical skill with more effect, even in circumstances familiar to him, but which may be absolutely necessary, or will at any rate save waste of labor and loss of time, when the knowledge acquired by practice in one place is to be employed in a new situation, and under a change of circumstances.

It is the object of this introduction to exhibit, in such a form as may be intelligible to those who have not made general chemistry an object of study, a concise view of such of the laws and facts of that science, as are absolutely necessary for the agriculturist who may wish to improve his practice, and which are more particularly required by those who wish to avail themselves of the knowledge contained in the subjoined essay. To do this has been found no easy task. It would be in itself difficult, but to the author of this introduction has been more particularly so, as he has for years been in the habit of imparting instruction to those whose habits of life and thoughts are as remote as possible from those of the practical farmer; persons to whom the peculiar language of chemistry is an aid instead of an impediment, and who, with ample time at their command, have an opportunity of pursuing the study of the science step by step. Fully aware of these difficulties, both general and peculiar, this attempt would not have been made, and certainly not persisted in, had it not have been for the instances of an intelligent, scientific and successful farmer, who has urged the completion of the task as an object likely to be beneficial to those, who, with perhaps equal zeal and native powers of mind, have not enjoyed like himself, the advantages of a scientific education.

The atmosphere which surrounds our earth is the first object to which our attention should be directed. This is the vehicle of the moisture, which, whether it fall in the form of rain or dew, run in streams or issue from springs, is absolutely essential to the success of the farmer's labor. It is also, as we shall presently see, important to him on other accounts.

The greater part of the atmosphere is made up of a mixture of substances, each of which has the same mechanical properties as the whole mass. These air-like substances are known to chemists by the name of *Gases*.

Of these gases, two make up by far the greater portion of atmospheric air, and exist in it in the proportion of about 4 to 1.—That which is the largest in quantity and makes up nearly 4-5ths of the whole atmosphere, is called, in the Essay of M. Puvis, by the name of Azot, but is more usually known in English by the name of Nitrogen.

This substance, although in the largest proportion, is the least important of the gases in its chemical effects. It does not aid in supporting the life of animals, nor in maintaining the burning (*combustion*) of inflammable bodies.

The part of the atmosphere which is absolutely necessary for these purposes, is called by the name of *oxygen*, and nearly makes up the remaining fifth part of atmospheric air. In its support of life it al-

ways, and in containing combustion often, unites with a chemical element, which is called *carbon*. This is familiarly known as forming the principal part of charcoal. In its union with carbon, oxygen forms a peculiar gas known by the name of carbonic acid.

Carbonic acid is always found in small quantities in the atmosphere, to which it is furnished by the breath of animals and the fumes of burning bodies. It is, when in considerable quantities, fatal to the life of animals, but is prevented from accumulating to an injurious extent in consequence of its being taken up by water; it is therefore dissolved, in proportions about equal to those in which it is formed by rivers, lakes, the ocean, and the moisture of the soil.

Water exists in the atmosphere in the form of vapour. The great source of this vapour is the extended surface of the ocean, and it is governed by a mechanical law, by which it is continually tending to distribute itselt uniformly over the whole surface of the earth. It may thus exist in as large quantities over the surface of the dryest land as over that of the ocean itself. The tendency to equal distribution is continually counteracted by the changes in the sensible heat (*temperature*) of the atmosphere, and of the surface of the earth, which follow the alternations of day and night, and the vissitudes of the seasons.—By these alternations and changes, the vapour is caused to fall (*precipitated*) in the form of rain, snow, hail, dew, or white frost, according to circumstances. Assuch changes of temperature are more frequent on the land than on the ocean, the water which falls on the former in either of these forms is greater in quantity than that which falls on equal surfaces of the latter. Thus by a wise and benevolent Providence, the water of the ocean is continually furnishing vapour, which is precipitated on the land for the support of vegetation and the supply of springs, and whose excess is poured back into the ocean in streams and rivers.

Water has been found by chemists to be a compound substance, made up of two elements. One of these, which forms 8-9ths of its weight, is the gas already mentioned under the name of oxygen; the other, a peculiar gas, known by the name of *hydrogen*.

Hydrogen, when free, is the lightest of all known bodies, rising and floating in atmospheric air; it not only combines with oxygen, to form water, but with carbon to form a great variety of compounds—gaseous, liquid, viscid, and solid. It also combines with nitrogen, and forms a gas known by the name of ammonia, which is well known by the peculiar smell it gives to spirits of hartshorn (*liquid ammonia.*)

Hydrogen also combines with sulphur, forming a gas known by the name of sulphuretted hydrogen; this exists in the atmosphere, but in such small quantities, as only to be detected by the nicest chemical tests. It combines in like manner with phosphorus, forming phosphuretted hydrogen gas, whose presence in the air is occasionally perceptible.

Oxygen, as we have seen, unites with carbon, to form a gas which we have called carbonic acid.

This receives the latter part of its name from its similiarity in properties to an extensive class of compound bodies, known by the name of *the acids*. The greater part of these, like carbonic acid, are combinations of inflammable bodies with oxygen. The most important of these in reference to our present object, are the sulphuric and phosphoric acids; named from the two substances (sulphur and phosphorus) which are their bases. Muriatic acid may also be mentioned here although its composition is of a different character. Oxygen unites with other bodies to form a class of compounds known under the name of oxides.

The acids unite with earths, alkalis, and metallic oxides, to form a class of compounds known under the general name of salts. These are named from the two substances which enter into their composition; thus, the salt formed of sulphuric acid and the earth lime, is called sulphate of lime.—The substances which unite with acids to form salts, are called the *bases* of the respective salts.

Of these bases, the alkalis, it is only necessary to know the names of two, namely, *potassa* and *soda*, and to be aware that their distinctive properties, are: to possess an acrid taste, a caustic operation to render oils capable of mixing with water, and to neutralize the properties of the acids.

The earth which the chemists call by the name of silex or *silica*, is found almost pure in flint and rock chrystal; it is also almost pure in sharp colourless sands, and is by far the larger part of sands of every description. So far as the farmer need know its properties: it is hard rough to the touch, has no attraction for water, which it permits to filter through, or evaporate from it, with the greatest ease. It is capable of uniting with the other in compounds which are called silicates, and is the only earth which enters into the formation of soils uncombined with the others or with other elements.

The earth which chemists call by the name of *alumina*, is so named because it is obtained by them in a pure form from the well known salt called alum, of which it is the basis. Its most marked characteristic is plasticity; that is to say, it may be formed into a paste with water, will then easily receive any form which may be given it, and retain that form unaltered, even by violent heat. It never exists in soils unmixed, but in intimate association, or more probably chemical combination with silicia, it is the well-known substance called clay, or argillaceous earth. White clays are this combination nearly pure, and colored clays often contain it with no other addition than metallic coloring matter. Clay retains the plastic property of alumina; it therefore causes soils to be retentiveof moisture; and when they dry, make them form tough clode or crusts, similar in character to sun-dried brick.

Soils which contain clay are often also mixed with sand, or with an excess of silicia in grains, which does not enter into the composition of the clay. Such a soil is less liable to form a tough crust than a pure clay, but it will require a very large proportion of sand to destroy this property altogether.

Clay mixed with sandy soils render them more retentive of moisture. Sand and clay have therefore been used as manures for each other; but it may reasonably be doubted whether all the advantage that has been anticipated by some from this process, can be realized, as such a mixture will be merely mechanical.

Loamy soils are generally said to be mixtures of sand and clay; they undoubtedly usually contain both these earths; and even sometimes a large excess of sand.—But we shall give reasons for believing that loams owe their peculiar value to a combination of clay with another substance, by which a change is produced in its chemical characters.

Lime is familiarly known by the same name that is generally used by chemists.—It is obtained by the aid of heat from rocks which go by the name of limestones.—These are combinations of lime with carbonic acid, which is fixed in them by chemical attraction, but which, when driven off by heat, takes the same form as the air of the atmosphere, or becomes a gas. This gas from this circumstance has been called *fixed air*, by which name it is often known when causing the sparkling and froth of cider and beer. The principal part of lime stone is therefore called by chemists *carbonate of lime*. Carbonate of lime is also found in shells, both those of living animals and those which exist in the ground in a fossil state. In the former it is mixed with animal matter which is more or less separated since the death of the shell fish.

Marl, in the sense in which the term is used by chemists, is a mixture of clay with carbonate of lime. The English writers on agriculture have not observed this distinction and the term is sometimes applied by them to a decomposed chalk, which may contain little or no clay: and sometimes to clay which contains no carbonate of lime. In fact, the name is frequently applied by them to any earthly matter found below the vegetable soil, which is capable of increasing its fertility. From this misapprehension, the substances which go by the name of marl in New-Jersey, Maryland, and Virginia, do not correspond with the chemical definition, but are generally beds of fo sil shells mixed in various proportions with earthy and saline matters of various kinds.

Lime is a substance very different in its characters from the two earths we have previously spoken. When prepared by heat from any of the original forms of its carbonate, it retains their shape unaltered, but may have its color changed, and always loses considerable in weight. It is now acrid, caustic and corrosive, and alkaline. Of these the most important is, that it unites with acids to form compounds included in the general class of salts. Of the salts of lime which are important to the farmer, the three principal are: the *carbonate*, which, as we havo stated, is found in lime-stone,

chalk, and marl; the *sulphate*, in which lime is combined with sulphuric acid, and which in combination with water is the substance so well known to our farmers under the name of plaster of Paris, or less familiarly by that of gypsum; the *phosphate*, which constitutes a part of the bone of animals.

Lime, when exposed to the air, attracts carbonic acid, which is always to be found in the atmosphere; it thus passes back to the state of carbonate, but in so doing gradually falls to powder, and is then said to be *air-slaked*. If slaked with water, it also falls to a powder, which still retains the caustic character of the burnt lime; but this powder, when exposed to the air, unites with when carbonic acid more rapidly than in mass.

Lime, in its caustic state, has the property of rapidly decomposing vegetable and animal substances, thus hastening the natural processes by which they are finally destroyed; or, to speak more properly, have their elements resolved into new combinations. The offensive and unwholesome gases, which are given out by this composition, are absorbed by the lime, and probably by its other compounds; but in order that either this earth or its compounds shall manifest this property, they must be in small fragments, or, which is better, in fine powder.

Wet sand and plastic clay, and those soils to which they give their characters, also possess the property of absorbing gases; but they have this in a very inferior degree to lime and its compounds. As the gases generated by the decomposition of vegetable and animal substances form a large part of the necessary food of plants, it is obvious that a soil which contains the carbonate of lime, may retain and store them up for use, while they will be lost in soils of a different character.

Carbonate of lime may also be made a most important article in the preservation of the most valuable parts of putrescent manures, until they can be applied to the soil. In this way marl is applied to a great extent in China; the night soil of their numerous population is there formed into cakes like bricks, with marl, and thus loses its offensive smell; but when these applied as manure to the land, they give out the gases again as they are required for the nourishment of plants. So also in Norfolk, the site for dung-hills is prepared by a layer of marl, which is incorporated with the manure from time to time, and retains the gases which would otherwise be lost.

Lime may therefore be applied in its caustic form in some cases in agriculture, for it will hasten the decomposition of animal and vegetable matters which might be otherwise inert; it will also neutralize acids, which experienced farmers well know to exist in many soils, which they in consequence call sour. But the latter purpose will be answered as well by the carbonate of lime, which may be applied as it exists in marl or shells, or as it may be prepared by grinding limestone. Caustic lime is also dangerous in its application, for it will corrode and destroy living vegetables, and hasten the decomposition of the vegetable matter of the soil to such a degree as to injure its fertility. Except upon turf bogs, and land loaded with timber not wholly decomposed, quick or caustic lime ought not to be used; but to burn lime, and then by slaking to reduce it to the form of fine powder, which is speedily carbonated by exposure to the air, is a more ready, and generally a cheaper mode of obtaining the carbonate in a convenient form, than to grind limestone to powder in mills. Yet for many of the most valuable uses of lime in agriculture, the latter method, if as cheap, would answer as well.

Lime slowly combines with the earth silica, and produces a compound very different in character from either. It is this, to cite a fact in proof of our statement, which gives the sharpness and solidity to ancient mortar. The carbonate of lime will serve to form this compound: and thus, when it has time to act upon sand, it renders a silicious soil more retentive of moisture; while, if applied to clay, by combining with its silicious matter, it renders it more friable; and it is to the formation of this compound, by slow degrees, that we are inclined to ascribe the valuable mechanical properties of loamy soils, and the gradual amelioration produced by the use of lime, marl, and shells, as a manure.

Besides silica, alumina, and lime, an earth called magnesia is likewise found in some soils. It is also, in the form of carbonate, a frequent constituent of limestones. This earth has many properties in common with lime; like lime it is capable of neutralizing acids; and when deprived of carbonic acid by heat, corrodes vegetable substances.—It probably also hastens putrefaction, and both it and its carbonate are capable of absorbing gases let loose in that natural process. It is, however, of little interest in agriculture, except as a part of some of the limestones which are used as a manure.—This, if applied in large quantities, are sometimes very injurious to vegetation; the reason of this is, that magnesia does not repass to the state of carbonate as rapidly as lime, and therefore contains its corrosive quality long after the lime has again become mild by its union with carbonic acid. In less quantities, however, the magnesian limestones may serve as a manure, but their application requires great caution, particularly when the quantity of magnesia amounts to twenty-five per cent.

All of the simple substances we have mentioned, except perhaps the last, either separate or in various states of combination, exist in plants. The manner and character of the combination is influenced by the vital action of the plant which causes them to form compounds, often in direct opposition to the manner in which the ordinary laws of chemistry would direct. It thus happens that so soon as the plant ceases to live, these chemical laws being no longer impended, begin to avert their influence; and if it be in such a state as will admit of the several elements acting readily upon each other, a decomposition, more or less rapid, of the vegetable structure ensues. It is a law of chemistry, that its action is always aided by the bodies being in a fluid state, and the action is often impossible when the bodies are perfectly free from moisture.—Hence the direct chemical action, and consequent decomposition, takes place with greater certainty and more rapidity in green juicy and succulent vegetables, than upon those which have been deprived of moisture either naturally or artificially. The grass, if heaped up in a recent state, decomposes, and if but partially dried, is heated, and may even take fire, by the chemical action of its elements; while, if dried by exposure to the sun and air, and then laid up in a dry place in the form of hay, it is almost indestructible. A moderate degree of heat and access to air is also necessary to promote the chemical action by which decomposition is effected. This decomposition is often attended with motion among the parts; and always, if the mass has a liquid form, as in the expressed juice of vegetables, or in the steeps employed by distillers and brewers, it goes in general terms by the name of fermentation. When the vegetable matter abounds in starch, the first change is the conversion of this principle into sugar. Sugar, if thus formed, is next converted into alcohol, as it is, if previously existed in the plant. The presence of alcohol gives the liquid in which it exists the charater of vinous liquors, and if these are permitted to remain in a turbid state, a farther fermentation converts them into vinegar; and finally vinegar is farther decomposed, and the vegetable matter, giving out an offensive smell, is said to putrify. If the substance be not an expressed juice or liquid steep, these several stages of fermentation ensue with rapidity, may be going on at the same time, and are sometimes so speedy in their course that no other action but the putrefactive fermentation can be detected. Animal bodies are subject to the same laws, and go through the same stages of fermentation, but the rapidity with which they run into putrefaction is even greater; still there are some cases, as in that of milk, where the vinous stage can be occasionally, and the acetic distinctly, observed.—Thus, a vinous liquor is prepared in some countries from milk, and the sour taste which appears in it when kept, arises from the presence of vinegar.

In the several stages of fermentation, parts of the vegetable assume the form of gas or vapor, and are given out to the air. The gases which have been detected, are carbonic acid, a gaseous compound of carbon and hydrogen, and in some instances ammonia. The vapor is that of water, which escapes in greater quantities than it would under ordinary circumstances, in consequence of the heat with which the process is attended. If exposed to rain, soluble salts with earthy and alkaline bases, are washed from the mass. Finally, a mass of earthy consistence alone remains, which, on examination is found to be made up of earths, insoluble salts, and carbon, being, in fact, identical with vegetable mould.

We may hence infer that the fol-

lowing elements exist in vegetable bodies:—

1. Oxygen, developed in the carbonic acid and water.
2. Hydrogen is in the water and carburets of hydrogen.
3. Carbon.
4. Earths.
5. Alkalis.
6. Nitrogen, occasionally developed in the form of ammonia.
7. Acids remaining in the insoluble, or washed away in in the soluble salts.

The chemical examination of vegetable bodies ought of course to lead to similar results. This examination has been conducted in 3 different ways.

1. With the view of discovering the nature of the compounds, called vegetable principles, which exist ready formed in plants.

2. For the purpose of discovering the chemical elements contained in these principles.

3. By the destructive action of heat, under which some of the elements are wholly separated, and others enter into new combinations.

In the first of these methods there have been detected:

I. Certain peculiar acids, of which we may cite

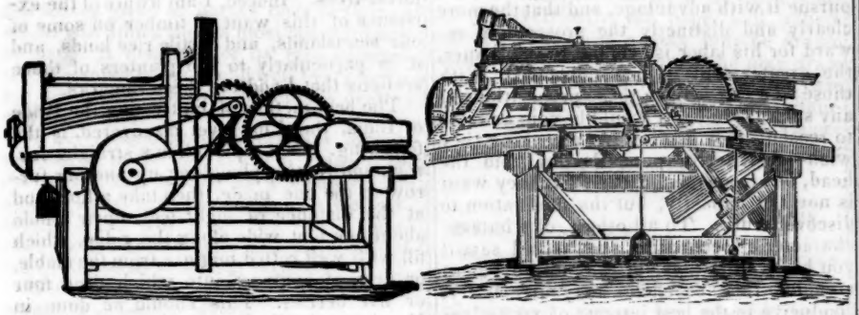
(1) Acetic acid, which, mixed with water, forms common vinegar.

(2) Citric acid, which is found in the lemon and orange.

(3) Malic acid, which exists in the apple.

(4) Tartaric acid, in the juice of the grape.

(5) Oxalic acid, in the wild sorrel.



CORNELL'S PATENT STAVE MACHINE.

Numerous inventions have at various times been patented to facilitate the making of staves for casks, barrels, &c., but few of which have proved successful. The one which is the subject of the present notice forms an exception. Competent judges give it a decided preference over any similar invention and are of opinion that it must eventually supersede the present economy of the branch of coopering which prepares the staves for the casks. This machine was invented by Philip Cornell a native of Vermont, but for many years a resident of Cayuga County, in this State, who died in 1834, soon after his invention was introduced to the notice of the public. At the last Fair of the American Institute this Machine was exhibited in operation and attracted great attention, and a gold medal was awarded as a premium to the proprietors by the Institute. The patent is now owned by a company in this city, who we understand offer for sale rights for making and using the machine on liberal terms. [Mr. Edwin Williams of this city, is Agent for the proprietors, office No. 180 Broadway.]

This machine is now in operation in several parts of the United States, and fully answers the expectations of the inventor and those who have purchased a right to use it. Like other labour saving machines which have been introduced into the mechanic arts, it has encountered the prejudices of many who are interested in the branch of industry to which it is applied, no doubt under the apprehension that it would lessen the demand for their labor. Experience will prove in this, as it has in other instances, that the apprehension is not well founded; that instead of lessening the demand for workmen, it will be increased, by the increased demand for the articles of which it produces but a part, requiring the hand of the workman to complete.

The sawing machine and the dresser, which together constitute a complete machine, will occupy a space of about ten feet square, and can be attached to an ordinary saw mill at an expense of geering not to exceed $50, and in most cases for a less sum. The power required to operate one machine, either steam, water, or wind, is equal to about seven horses. Two men will be required to a machine. An ordinary mill, with one saw, will supply timber for three machines. The timber is first sawed into plank $3\frac{3}{4}$ inches thick, and then cut to the length of the staves required.—Staves can be made from any kind of wood without regard to the grain. A machine will complete two thousand oak barrel staves per day, of ten working hours; these staves require assorting, and such as are unfit for tight casks, answer well for dry ones. The loss of stuff is very trifling. The cost of a machine for hogshead or pipe staves is $325, and for barrel staves $300, exclusive of the charge for patent right.

*Extract from the Report of the Committee of the American Institute, adopted October 1, 1835.*

"With dilligent attention and adequate power, one set of these machines, of which there are in effect three, two of them, the bevelling and smoothing machines being separate in their action, although constructed in one frame, and the machine for sawing out the staves being separate in another, it is highly probable that two men supplied with material at hand, could saw, bevel, and smooth *three thousand* barrel staves in a day of ten working hours.

"These machines are evidently great labor saving machines, and it is believed they are more perfect than any others designed for this manufacture. They possess the rare test of mechanical perfection, in being quite independent of great skill or cleverness in the operator. Any faithful, diligent, and industrious labourer, of ordinary intelligence, can work them with advantage.

"Your Committee recommend these machines as eminitely useful in the manufacture of staves, and anticipate that their perfection will suggest some corresponding improvement in the manufacture of barrel and pipe heads, yet much needed in this branch of the arts."

*Copy of a letter from* A. W. EDWARDS, *of Fulton, Oswego County, New-York, who had in use two of the Machines, and was waiting for the other.*

"I am in very great want of a dressing Machine. I have 30,000 staves already seasoned to dress, and plenty of contracts waiting to be supplied. I would not be without the Machine for ten dollars per day. I find no difficulty in cutting *ten staves* per minute, and I can very nearly average that from Oak timber, of which I use considerable.

*From* BROWN, LORD & Co. *of Bangor, Maine, who have had a Machine in operation one year.*

"In answer to your request respecting Philip Cornell's Stave Machine, we are happy to state, that it fully answers our expectations, and all concur in giving it their decided approbation after seeing it. As it respects the market for the staves, we have no difficulty in disposing of all the staves that we make, at about twice the market price of similar staves made in the usual way. BROWN, LORD & Co."

*From the Washington (North Carolina) Whig, February* 27, 1836.

"*Cornell's Stave Machine,*—The staves made by this Machine are, without exception the most beautiful and correctly jointed and dressed staves we ever beheld. A barrel made of Pine staves was exhibited full of *spirits of turpentine*, which had been filled about a week and remained perfectly tight. We were present when the same barrel had been filled with water before, and it was then perfectly tight also. There does not remain a doubt but that it (the machine) makes staves from any kind of wood, far superior to those dressed in the usual way. Barrels made of them need no flagging, and the staves must make a tight joint. The bilge or size of the barrel may be varied at pleasure, as well as the thickness or length of the stave."

*Extract of a letter from Messrs* TANNAHILL & LAVENDER, *Washington, N. C., May* 25, 1836.

"The sample of staves (made by Cornell's Machine,) sent by us to the West Indies, were very much approved, and contracts might have been made for cargoes."

*From* JOHN P. OBER & Co. *Elsworth, Maine.*

The subscribers have had in operation for three months, at Elsworth, Hancock County, Maine, one of Cornell's Patent Stave Machines, and find it to answer our expectations in every respect; we have finished twenty-eight staves, thirty-two inches long, of beach wood, in five minutes, and can average two thousand every day of ten working hours. We obtain for the staves for barrels of Beach, Birch and Ash, from

twelve to fifteen dollars per thousand, (nett 1,000.) We have proved the barrels and casks made with the Machine, and find they will answer for liquor or dry casks, as well as those made from any other staves.

JOHN P. OBER & Co.

(One of this firm is a Practical Cooper.)

Those who wish to see the Machine in operation in this city may have an opportunity by calling at the office of the Mechanics Magazine and Railroad Journal, 132 Nassau street.

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AGRICULTURAL PAPERS.

While contemplating the immense and incalculable benefits which must necessarily result not only to the farmer and planter, but to the public in general, and to every class of the community in whatever occupation engaged, from the general improvement of agriculture and the powerful tendency of agricultural papers to produce such improvement, the man of reflection, who loves his country, and who feels any regard for the happiness of his fellow men, cannot but be struck with astonishment, not only at beholding so many of those who are devoted to the profession of agriculture, and who are entirely dependent on it for the supply of all their wants, voluntarily debarring themselves from the easiest, the most agreeable, the cheapest, and the most effectual mode of acquiring knowledge in their profession—but at the short-sighted views of those who are obviously not less deeply interested than the farmer himself, in producing that state of improvement, on the production of which the prosperity of all is alike dependent. Let every man but ask himself, what would be the effect on the public prosperity, and on that of every individual of which society is composed, whatever may be his occupation, were the fertility of the land and the quantum of his annual production to be doubled, trebled, or quadrupled—all must see at a glance, that the national wealth and resources would be in the same degree enhanced. The government would be enabled, with far less inconvenience to the people, to raise double, treble, or quadruple the revenue which can now be collected, either for the purpose of defending the country against foreign enemies, improving it by roads, canals, &c., or for what is of still greater importance than either, the establishing and sustaining a system of Universal Education, by which, and by which alone, liberty can be perpetuated, the people elevated to that dignity and worth of which they are capable, and which it should be considered the first duty of every Republican Government to confer. The farmer and planter would be benefitted by receiving a double, a treble, or quadruple reward for his labor, to be expended in supplying his wants, increasing his wealth, or promoting his comfort. The merchant, the lawyer, and the mechanic, will be benefitted by a double, treble, or quadruple ability in their customers to purchase their goods, or to reward them for their services; and above all, the laborer of every description, would be benefitted by constant employment, and good wages paid in ready money. In a word, universal prosperity would overflow the land, and universal intelligence and increase of virtue, would enable and dispose the people so to use it, as to banish from the country by far, the larger portion of that misery and distress under which mankind, in all ages and countries, have heretofore groaned, and which must continue to be their lamentable lot, until by an elevation of the intellectual and moral character of the mass of the people, they shall be qualified so to improve the resources which a benignant Providence has placed at their command, as to enable every one, by moderate labor, to acquire the necessaries and comforts of life. That such would be the ultimate effects of doubling, trebling, quadrupling the products of the earth by the industrious exertions of the agricultural community, if guided and directed by intelligence, is too plain to require proof. Would the general circulation of agricultural papers, by diffusing knowledge, and by continually presenting to the mind of the agriculturist, clear, unequivocal and demonstrative proof, that great and amply rewards, are the sure and certain consequence of such exertions, have a tendence to stimulate the community to active and intelligent exertions? He who doubts this, must believe the gross and palpable absurdity, that the greater the knowledge a man possesses of the business in which he is engaged, the more will he be disqualified to pursue it with advantage, and that the more clearly and distinctly the prospect of reward for his labor is held out to the farmer, the greater will be his indolence. With those who can believe these propositions, if any such there be, it would be vain and idle to reason—they can believe any thing they wish—their error proceeds not from the head, but from the heart—what they want is not the capacity, but the inclination to discover truth. To all others, of whatever character or occupation, we would say, if you believe that agricultural improvement would be thus beneficial to your country, conducive to the best interest of yourselves and of your fellow citizens, of every class and description, and that the wide and general circulation of agricultural papers would have a tendency to produce that improvement, do not patriotism, philanthropy, and an enlightened regard to your own interest, all conspire to demand, that you should exert yourselves by every means in your power, by your example, by your exhortations, by your instructions, and by your influence, to extend as widely as possible the circulation of papers entirely devoted to the diffusion of agricultural knowledge and the production of agricultural improvement—papers whose influence, while it may be productive of such incalculable good, can by no possibility be injurious to any human being? We ask you, calmly, soberly, and deliberately, to consider the subject, and then to act in such a manner as reason, conscience, patriotism, and an enlightened regard to your own interest, shall dictate. For ourselves, we entertain not a particle of doubt, that were some well conducted agricultural paper generally circulated and read in every neighborhood in the United States, its salutary influence would, in a few years, be clearly exhibited in the intellectual and moral improvement of the people, in the increase of the national wealth and resources, and in the increased happiness and prosperity of all classes of the community. To the production of such results we are not only willing, but desirous of contributing our utmost exertions, and it is therefore, that we solicit all those who have it in their power by the communication of agricultural knowledge, and by their exertions in promoting its diffusion to the widest practical extent, to afford us their aid and co-operation—on that aid and co-operation, we are fully sensible, must the success of ours, and similar efforts, in a great measure depend.—[Tenn. Farmer.]

From the Southern Agriculturist.

ON THE PRIDE OF INDIA TREE, AS AN ARTICLE FOR FENCING.

DEAR SIR,—At your request, I furnish you with my observations on the Pride of India Trees, as an article of fencing, in places where timber is scarce and of indifferent quality. I have, myself, been at some pains in cultivating this high valuable tree; and bringing it to that state of perfection, which I have heard it attains, in its native clime. The result of my experience is, that it may be made one of the most useful and profitable fencing and timber trees known to the southern plantation. Our country is becoming, every year, more thickly settled, and as cultivation is pushed on, the vast primeval forests which cover the land, must necessarily disappear before the woodman's axe. The consequence is, that in a few years we will begin to feel the want of the necessary wood and timber for our farming purposes, and see the utility of setting out plantations of the more valuable forest trees. Indeed, I am aware of the existence of this want of timber on some of our sea-islands, and fertile rice lands, and it is particularly to the planters of those sections that I address these remarks.

The best method of cultivating the Pride of India, that I have yet discovered, is the following. Run a plough in a straight furrow, and return, ploughing up another furrow to the one made, then take a hoe, and at the distance of eight feet, open a hole about one foot wide along the ridge, which fill with well rotted manure from the stable, or heap of compost, into which drop four or five berries. This should be done in March or April. Cover them lightly and attend the young plants as you would cotton, keeping down grass and weeds, and pulling up the weak and slender shoots, leaving but one of the most healthy and vigorous. Go over this twice in the course of three months, with a plough, turning over the furrow to the plants. The young trees will rapidly grow to the height of six or eight feet. During this time, you must occasionally strip off the leaves and lateral shoots, in order to train the stems to a certain length. Keep them merely straight twigs to which they will naturally tend, until the next spring, when you will direct them to grow as upright as possible, keeping down weeds and grass as in the year before. In this year they will attain the thickness of about twelve inches in circumference; and by the next spring the height of twelve or fifteen feet. The growth may, however, be improved by the use of the hoe and manuring. They may now be permitted to put out lateral limbs, suffering the most vigorous to continue, and taking off the weak ones while young, with a pruning knife. This will preserve the quality and beauty of the timber, making it fit in fifteen years for all manner of furniture.

The value of the wood cannot be too highly appreciated. It may be sawed into boards from twelve to eighteen inches wide, fit for almost any purpose, or into wainscoting of the most beautiful shades. It is a light, sonorous wood, not apt to split, and capable of a very high polish. It is entirely divested of any resinous matter, and thereby fitted to receive the most beautiful varnishes. It possesses powerful vermifugous qualties, and thereby fitted for all furniture of the bed chamber, as no bugs or any other insect will infest it. The texture or quality of the wood may be improved by being grown on land of a clay bottom, but will grow well on the loosest sandy loam.

It should be raised from the seed in the manner I have described. If transplanted, its tap-roots will never grow, and the quality of the wood is much impaired. Besides, it will be more apt to be blown down, being supported only by lateral roots, these taking their sole pabulum from the rich loam on the surface, and giving to the wood a soft spongy texture.

As an article for fence posts, I can safely recommend it as one of the cheapest and most durable. In this latter quality it approximates more nearly to cedar than any wood I know. It may be planted where the fence is intended to be run, and your rails may be nailed to the body of the tree. The superfluous branches will afford an excellent fire-wood.

The foilage of this tree affords a wholesome provender for cattle. Horses, cows, hogs, sheep, &c. will eat the leaves greedily. When dried and mixed with hay, I know of no better medicine for cattle of every kind. Such are the vermifugous qualities of the entire tree, that I never fail to give it to my animals every spring. A few leaves given to horses once or twice a week, will afford them a most beautiful coat of hair. A decoction of its root administered in small doses to children every morning for nine days, will effectually destroy worms in them.

A correspondent of yours has already testified as to the excellence of Pride of India leaves and berries as a manure; and also as a preventive to bugs. To his testimony, I can safely add my own. I have tried both experiments, and have experienced the most beneficial results.

With every wish for your success, Mr. Editor, I subscribe myself

COLBERT.

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From the Genesee Farmer.

### WHO WILL NOT PLANT A LOCUST TREE?

A Mr. Hale of Westhampton, (Mass.) obtained last year for thirteen locust trees, delivered at the river in West Springfield, 50 cents per cubic foot including all the limbs, except those quite small. The trees measured 306 feet, and amounted to 153 dollars; thus producing 153 dollars for less than two and a half cords of wood. Let us make this fact the basis of a little calculation. The locust will thrive abundantly on favorable soils when planted a rod apart, or one hundred and sixty on an acre. Mr. Hale's trees averaged him $11,72 a tree, which for an acre of trees of the same size would bring one thousand eight hundred and seventy-five dollars twenty cents. It has been estimated that six locust trees of twelve years growth will produce a cord of wood, and in many instances they have far exceeded it; but to be on the safe side, we will take six and a half and let them grow eighteen years instead of twelve, and then the avails of the acre will exceed one hundred dollars a year for the eighteen years. If this is not a handsome profit we know not what is; and there is this additional circumstance attending it; locust timber will not fall in price, as the demand, from the nature of the case, must continually increase. Then plant the locust by the wayside, fill up the vacancies in your woodlands with it—remembering that every one that grows, puts in your pocket 100 per cent per annum. G.

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### ELECTRICAL SHOCK FROM A SHEET OF PAPER.

Place an iron japanned tea tray on a dry, clean beaker-glass, then take a sheet of foolscap writing-paper, and hold it close to the fire until all its hygrometic moisture is dissipated, but not so as to scorch it; in this state it is one of the finest electrics we have. Hold one end down on a table with the finger and thumb, and give it about a dozen strokes with a large piece of India-rubber from the left to the right, beginning at the top. Now take it up by two of the corners and bring it over the tray, and it will fall down on it like a stone; if one finger be now brought under the tray, a sensible shock will be felt. Now lay a needle on the tray with its point projecting outwards, remove the paper, and a star sign of the negative electricity will be seen; return the paper, and the positive brush will appear. In fact, it forms a very good extemporaneous electrophorus, which will give a spark an inch long, and strong enough to set fire to some combustible bodies, and to exhibit all the electric phenomena not requiring coated surfaces. If four beaker-glasses are placed on the floor, and a book laid on them, a person may stand on them insulated; if he then holds the tray vertically, the paper will adhere strongly to it, and sparks may be drawn from any part of his body, or he may draw sparks from any other person, as the case may be; or he may set fire to some inflammable bodies by touching them with a piece of ice.

I beg to remain,
Yours, &c.

G. DAKIN.

Oxford, March 20, 1836.

We suppose that every one having occasion to clean paper with Indian-rubber during the past winter, has noticed the remarkable force with which the paper adheres to the table.

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Agriculture aided by science, will make a little nation a great one.

All the energy of the hero, and all the science of the philosopher, may find scope in the cultivation of one farm.


STEPHENSON,

*Builder of a superior style of Passenger Cars for Railroads.*

No. 264 Elizabeth street, near Bleecker street, New-York.

RAILROAD COMPANIES would do well to examine these Cars; a specimen of which may be seen on that part of the New-York and Harlaem Railroad now in operation. J25tf

HUDSON & BERKSHIRE RAILROAD.

NOTICE TO CONTRACTORS.

SEALED PROPOSALS will be received by the Hudson & Berkshire Railroad Company, at their office in the city of Hudson, until the 20th day of July, for excavating and embanking 16 miles of their road from Chatham 4 Corners to the city of Hudson. Also 2 bridges of 50 and 70 feet span. Profiles of the route will be exhibited at the Railroad office in the city of Hudson, divided into sections of half a mile and one mile each, for examination, by the 1st of July next. Proposals will also be received for furnishing 300,000 feet of white pine, chestnut, or white hemlock sills, 5 by 8 and 16 feet long; and 10,000 chestnut ties, 8 feet long and 6 inches square.

Persons applying for contracts will be expected, unless personally known to the company or engineer, to present with their proposals, recommendations as to their ability to perform their contracts.

GEORGE RICH, Chief Engineer.
Hudson, June 25, 1836. 25—tj20

NOTICE OF THE NEW-YORK AND ERIE RAILROAD COMPANY.

THE Company hereby withdraw their Advertisement of 26th April, in consequence of their inability to prepare in time, the portions of the line proposed to be let on the 30th June, at Binghampton, and on the 11th of July at Monticello. Future notice shall be given, when proposals will be received at the above places, for the same portions of the road.

JAMES G. KING, President.
21—tf

ARCHIMEDES WORKS.

(100 North Moor street, N. Y.)

NEW-YORK, February 12th, 1836.

THE undersigned begs leave to inform the proprietors of Railroads that they are prepared to furnish all kinds of Machinery for Railroads, Locomotive Engines of any size, Car Wheels, such as are now in successful operation on the Camden and Amboy Railroad, none of which have failed—Castings of all kinds, Wheels, Axles, and Boxes, furnished at shortest notice.

H. R. DUNHAM & CO.
4—ytf

TO CONTRACTORS.

PROPOSALS will be received at the Office of the Eastern Railroad Company, Boston, between the 28th and 30th inst., for the grading and masonry of said Road from East Boston to Newburyport, a distance of 33¼ miles

The line of this road is along a favorable country, passing through Lynn, Salem, Beverly, and Ipswich, which places will afford contractors every facility for obtaining provisions, &c. Plans and Profiles will be ready, and may be seen at the Office, after the 22d instant.

Satisfactory recommendations must accompany the proposals of those who are unknown to the Engineer.

JOHN M. FESSENDEN, Engineer.
22—t30j

THE SUBSCRIBER is authorised to sell PAGE'S MORTICING MACHINES, to be used in any of the *Western*, *Southern*, or *Middle* States, (except New-Jersey,) and also to sell Rights for *Towns*, *Counties*, or *States*, in the same region, *including New-York*.

MACHINES will be furnished complete, ready to work, and at a *liberal discount* to those who purchase territory, or machines to sell again.

Applications may be made by letter, *post paid*, or personally, to

D. K. MINOR, Agent for Proprietor,
132 Nassau street, New-York.

☞ Terms of *single* machines, $30 to $35, for *common morticing*; and $50 to $60 for HUB machines, which, in the hands of an experienced man, will mortice 14 to 16 setts of common carriage or wagon hubs per day.

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☞ WILL be published, in a few days, NICHOLSON'S *Treatise on Architecture*.—Also, PAMBOUR on *Locomotive Engines on Railroads*.

## NOTICE TO CONTRACTORS.

JAMES RIVER AND KANAWHA CANAL.

PROPOSALS will be received at the Office of the James River and Kanawha Company, in the City of Richmond, from the 15th to the 23rd day of August, for the construction of all the Excavation, Embankment and Walling not now under contract, together with nearly all the Culverts and the greater portion of the Locks between Lynchburg and Maidens' Adventure.

The work now advertised embraces the twenty miles between Columbia and the head of Maidens' Adventure Pond, the eight miles between Seven Island Falls and Scottsville, and about twenty isolated sections, reserved at the former letting, between Scottsville and Lynchburg.

The quantity of masonry offered is very great—consisting of about two hundred Culverts of from three to thirty feet span; nine Aqueducts, thirty-five Locks a number of Wastes, with several farm and road Bridges.

General plans and specifications of all the work, and special plans of the most important Culverts and Aqueducts, will be found at the offices of the several Principal Assistant Engineers on the line of the Canal.

The work will be prepared for examination by the 25th July; but mechanics, well recommended, desirous of immediate employment, can obtain contracts for the construction of a number of Culverts at private letting.

Persons offering to contract, who are unknown to the subscriber, or any of the Assistant Engineers, will be expected to accompany their proposals by the usual certificates of character and ability.

CHARLES ELLET, Jr.,
Chief Engineer of the James River and Kanawha Company.

NOTE.—The Dams, Guard-Locks, most of the Bridges, and a number of Locks and Culverts, are reserved for a future letting. Persons visiting the line for the purpose of obtaining work, would do well to call at the office of the Company in the city of Richmond, where any information which they may desire will be cheerfully communicated.

The valley of James River, between Lynchburg and Richmond, is healthy. (20—ta18) C. E. Jr.

## AMES' CELEBRATED SHOVELS, SPADES, &c.

300 dozens Ames' superior back-strap Shovels
150 do do do plain do
150 do do do cast steel Shovels & Spades
150 do do Gold-mining Shovels
100 do do plated Spades
50 do do socket Shovels and Spades.

Together with Pick Axes, Churn Drills, and Crow Bars (steel pointed,) manufactured from Salisbury refined iron—for sale by the manufacturing agents,

WITHERELL, AMES & CO.
No. 2 Liberty street, New-York.
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N. B.—Also furnished to order, Shapes of every description, made from Salisbury refined Iron. 4—ytf

## RAILWAY IRON.

95 tons of 1 inch by ¼ inch.
200 do 1¼ do ¼ do
40 do 1¼ do ⅜ do
800 do 2 do ¼ do
800 do 2¼ do ⅜ do
soon expected.

FLAT BARS in lengths of 14 to 15 feet, counter sunk holes, ends cut at an angle of 45 degrees, with splicing plates and nails to suit.

250 do. of Edge Rails of 36 lbs. per yard, with the requisite chairs, keys, and pins.

Wrought Iron Rims of 30, 33, and 36 inches diameter for Wheels of Railway Cars, and of 60 inches diameter for Locomotive Wheels.

Axles of 2¼, 2¾, 2⅞, 3, 3¼, 3½, and 3⅝ inches in diameter, for Railway Cars and Locomotives, of patent iron.

The above will be sold free of duty, to State Governments and Incorporated Governments, and the drawback taken in part payment.

A. & G. RALSTON,
9 South Front street, Philadelphia.

Models and samples of all the different kinds of Rails, Chairs, Pins, Wedges, Spikes, and Splicing Plates, in use both in this country and Great Britain, will be exhibited to those disposed to examine them.
4—d7 1maowr

☞ THE NEWCASTLE MANUFACTURING COMPANY, incorporated by the State of Delaware, with a capital of 200,000 dollars, are prepared to execute in the first style and on liberal terms, at their extensive Finishing Shops and Foundries for Brass and Iron, situated in the town of Newcastle, Delaware, all orders for LOCOMOTIVE and other Steam Engines, and for CASTINGS of every description in Brass or Iron RAILROAD WORK of all kinds finished in the best manner, and at the shortest notice.

Orders to be addressed to
MR. EDWARD A. G. YOUNG,
Superintendent, Newcastle, Delaware.
feb 20—ytf

## FRAME BRIDGES.

THE subscriber would respectfully inform the public, and particularly Railroad and Bridge Corporations that he will build Frame Bridges, or vend the right to others to build, on Col. Long's Patent, throughout the United States, with few exceptions. The following sub-Agents have been engaged by the undersigned who will also attend to this business, viz.

| | |
|---|---|
| Horace Childs, | Henniker, N. H. |
| Alexander McArthur, | Mount Morris, N. Y. |
| John Mahan, | do do |
| Thomas H. Cushing, | Dover, N. H. |
| Ira Blake, | Wakefield, N. H. |
| Amos Whitmore, Esq., | Hancock, N. H. |
| Samuel Herrick, | Springfield, Vermont. |
| Simeon Herrick, | do do |
| Capt. Isaac Damon, | Northampton, Mass. |
| Lyman Kingsly, | do do |
| Elijah Halbert, | Waterloo, N. Y. |
| Joseph Hebard, | Dunkirk, N. Y. |
| Col. Sherman Peck, | Hudson, Ohio. |
| Andrew E. Turnbull, | Lower Sandusky, Ohio. |
| William J. Turnbull, | do do |
| Subried Dodge, Esq., | (Civil Engineer,) Ohio. |
| Booz M. Atherton, Esq. | New-Philadelphia, Ohio. |
| Stephen Daniels, | Marietta, Ohio |
| John Rodgers, | Louisville, Kentucky. |
| John Tillson, | St. Francisville, Louis'a. |
| Capt. John Bottom, | Tonawanda, Penn. |
| Nehemiah Osborn, | Rochester, N. Y. |

Bridges on the above plan are to be seen at the following localities, viz. On the main road leading from Baltimore to Washington, two miles from the former place. Across the Metawamkeag river on the Military road, in Maine. On the National road in Illinois, at sundry points. On the Baltimore and Susquehanna Railroad at three points. On the Hudson and Patterson Railroad, in two places. On the Boston and Worcester Railroad, at several points. On the Boston and Providence Railroad, at sundry points. Across the Contocook river at Hancock, N. H. Across the Connecticut river, at Haverhill, N. H. Across the Contoocook river, at Henniker, N. H. Across the Souhegan river, at Milford, N. H. Across the Kennebec river, at Waterville, in the state of Maine.—Across the Genesse river, at Mount Morris, New-York, and several other bridges are now in progress.

The undersigned is about to fix his residence in Rochester, Monroe county, New-York, where he will promptly attend to orders in this line of business to any practicable extent in the United States, Maryland excepted. MOSES LONG.

General Agent of Col. S. H Long.
Rochester, May 22d, 1836. 19y-tf.

## PATENT RAILROAD, SHIP AND BOAT SPIKES.

☞ The Troy Iron and Nail Factory keeps constantly for sale a very extensive assortment of Wrought Spikes and Nails, from 3 to 10 inches, manufactured by the subscriber's Patent Machinery, which after five years successful operation, and now almost universal use in the United States, (as well as England, where the subscriber obtained a patent,) are found superior to any ever offered in market.

Railroad Companies may be supplied with Spikes having countersink heads suitable to the holes in iron rails, to any amount and on short notice. Almost all the Railroads now in progress in the United States are fastened with Spikes made at the above named factory—for which purpose they are found invaluable, as their adhesion is more than double any common spikes made by the hammer.

*** All orders directed to the Agent, Troy, N. Y., will be punctually attended to.

HENRY BURDEN, Agent.
Troy, N. Y., July, 1831.

*** Spikes are kept for sale, at factory prices, by I. & J. Townsend, Albany, and the principal Iron Merchants in Albany and Troy; J. I. Brower, 222 Water street, New-York; A. M. Jones, Philadelphia; T. Janviers, Baltimore; Degrand & Smith, Boston.

P. S.—Railroad Companies would do well to forward their orders as early as practicable, as the subscriber is desirous of extending the manufacturing so as to keep pace with the daily increasing demand for his Spikes.

1J23am H. BURDEN.

## RAILROAD CAR WHEELS AND BOXES, AND OTHER RAILROAD CASTINGS.

Also, AXLES furnished and fitted to wheels complete at the Jefferson Cotton and Wool Machine Factory and Foundry, Paterson, N. J. All orders addressed to the subscribers at Paterson, or 60 Wall street, New-York, will be promptly attended to.

Also, CAR SPRINGS.

Also, Flange Tires, turned complete.

J8 ROGERS, KETCHUM & GROSVENOR.

## MILL-DAM FOUNDRY.

WILL be sold at public auction, (unless previously disposed of at private sale,) the above well known establishment, situated one mile from Boston. The improvements consist of—

No. 1. Boiler House, 50 feet by 30 feet, containing all the necessary machinery for making boilers for Locomotive and other steam Engines.

No. 2. Blacksmith's Shop, 50 feet by 20, fitted with cranes for heavy work.

No. 3. Locomotive House, 54 feet by 25, used for putting together Locomotive Engines. Several of the best Engines in use in the United States have been put in this establishment.

No. 4. A three story brick building, covered with slate, 120 feet by 46, containing two water-wheels, equal to 40 horse power; Machine Shop, filled with lathes, &c.; Pattern Shop; Rolling Mill and Furnaces, capable of rolling 4 tons of iron per diem, exclusive of other work; three Trip Hammers, one of which is very large; engine for blowing Cupola Furnaces, moved by water-wheel; one very superior 12 horse Steam Engine, which could be dispensed with; and a variety of other machinery.

No. 5. An Iron Foundry, 80 feet by 45, with a superior air Furnace, and two Cupolas, Core oven, Cranes, &c. fitted for the largest work. Attached to the Foundry is a large ware-house, containing Patterns for the Castings of Hydraulic Presses, Locomotive and other Steam Engines, Lead Mill Rolls, Geering, Shafts, Stoves, Grates, &c. These were made of the most durable materials, under the direction of a very scientific and practical Engineer, and are supposed to be of great value.

No. 6. A building, 65 feet by 36, containing a large stack of chimneys, and furnaces, for making Cast Steel. This building is at present used as a boarding-house, and can accommodate a large number of men.

No, 7. A range of buildings, 200 feet long by 36, containing counting room, several store rooms, a Brass Foundry, room for cleaning castings, a large loft for storing patterns, stable for two horses, &c. &c.

The above establishment being on tide water, presents greater advantages for some kinds of business than any other in the United States. Coal and Iron can be carried from vessels in the harbors of Boston, to the wharf in front of the Factory, at 25 to 30 cents per ton. Some of the largest jobs of iron work have been completed at this establishment; among others, the great chain and lift pumps for freeing the Dry Dock at the Navy Yard, Charleston.

The situation for Railroad work is excellent, being in the angle formed by the crossing of the Providence and Worcester Railroads. The Locomotive "Yankee," now running on the latter road, and the "Jonathan," purchased by the State of Pennsylvania, were built at these works. With the Patterns and Machinery now on the premises, 12 Locomotives, and as many tenders, besides a great quantity of cars and wagons, could be made per annum.

For terms, apply to
THOS. J. ECKLEY, Treas. &c. Boston,
or to ROBERT RALSTON, Jr. Phila.
Boston, April 21, 1835. j25—4t

## ALBANY EAGLE AIR FURNACE AND MACHINE SHOP.

WILLIAM V. MANY manufactures to order. IRON CASTINGS for Gearing Mills and Factories of every description.

ALSO—Steam Engines and Railroad Castings of every description.

The collection of Patterns for Machinery, is not equalled in the United States. 9—1y